MEDICAL LIBRARY
NOV 17 1936

SERIES 3, Vol. 19, No. 11 NOVEMBER, 1936

AMERICAN JOURNAL OF OPHTHALMOLOGY

CONTENTS

	Page
Original Papers	
A new operation for chronic glaucoma. Otto Barkan	951
An investigation of the angular relation of the visual (visierlinie) and optic (corneal) axes of the eye. George E. Park	967
Observations on the reducing substances (glucose) of the aqueous and vitreous humors of the eye. William M. James and A. J. Siefker	975
Keratoconjunctivitis with adenitis in Calcutta. Saradindu Sanyal	982
Orthoptic treatment of strabismus. J. L. Bressler	989
Visual tasks in sight-saving classes. Matthew Luckiesh and Frank K. Moss	992
Failures and successes in the operative treatment of detachment of the retina. Thomas D. Allen	1000
Notes, Cases, Instruments	
A one-meter perimeter. Alfred Cowan	1005
A technique for intracapsular extraction of cataract. Daniel B. Kirby	1006
Unusual cataract complication forty years after operation. Virgil J. Schwartz	1006
Epidemic keratoconjunctivitis diversiformis. H. G. Merrill	1007
Society Proceedings	
Minnesota, Los Angeles, London, Chicago, Colorado	1009
Editorials	
Nerve strains of vision; The reticulo-endothelial system; The New York meeting of the American Academy of Ophthalmology and Otolaryngology	1018
Book Notices	1022
Obituary	1025
Correspondence	1025
Abstract Department	1027
News Items	1051

For complete table of contents see advertising page V

Copyright, 1936, Ophthalmic Publishing Company, 640 South Kingshighway, Saint Louis, Missouri

Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars.

Published monthly by the George Banta Publishing Company, 450 Ahnaip Street, Menasha, Wisconsin, for the Ophthalmic Publishing Company, 640 S. Kingshighway, Saint Louis, Missouri

Editorial Office: 640 S. Kingshighway, Saint Louis, Missouri

Entered as second class matter at the post office at Menasha, Wisconsin

Now YOU CAN COMPLETELY REFURNISH YOUR RECEPTION ROOM WITH FINEST CHROMIUM FOR ONLY

$98.75

Picture your reception room with modern chromium furniture. Imagine the ease and contentment of your patients as they wait for you in comfort amid pleasant modern surroundings. Realize how the smart appearance and cleanliness of chromium furniture impresses them. Think of the self satisfaction that comes from being marked as a progressive practitioner. Think how much all these things can mean to you—and then act. Send for your copy of Riggs' Troy Chromium catalog. In it you find a complete line of well designed, smartly styled furniture—at reasonable prices. For example—the attractive ensemble pictured above costs only $98.75—payable over 20 months on a Riggs' convenient payment plan. Today, one can't afford to be old fashioned. Go modern in good taste with Riggs' Troy Streamline metal.

Troy Furniture Is the Finest Chromium You Can Buy—The Troy Sunshade Company of Troy, Ohio, recognized leaders in Chromium furniture design and manufacture, make Troy Streamline Metal from the finest materials to the most exact specifications. It will give long, practical service and its smart styling is modern in good taste.

Only Riggs Offers This Service That Assures Beauty and Refinement. When desired, Riggs Decorating Service will suggest a complete color treatment for walls, floors and ceilings, to blend with the shades of upholstering selected for the streamline furniture. This assures you of proper color blending—a most important factor.

RIGGS OPTICAL COMPANY

General Offices • Merchandise Mart • Chicago, Illinois

AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 19 NOVEMBER, 1936 NUMBER 11

A NEW OPERATION FOR CHRONIC GLAUCOMA

Restoration of physiological function by opening Schlemm's canal under direct magnified vision

OTTO BARKAN, M.D.
SAN FRANCISCO

It is suggested that this operation solves the surgical problem in the majority of cases of chronic glaucoma. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber is in full view and magnified during the operation. The surgeon can see the area of blockage, which is the cause of the glaucoma, and guide his instrument in restoring the normal outlet for the intraocular fluid. The results are predictable and appear to be permanent, the longest period of observation to date being one of 11 months. The operation is without danger when the proper technique is used and has proved successful in the writer's hands when the necessary preoperative indications (binocular microgonioscopic diagnosis) have been fulfilled. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936. Demonstrated before the Section of Ophthalmology of the American Medical Association at Kansas City, Missouri, May 14, 1936.

History of present-day glaucoma operations

The successful surgical treatment of glaucoma was originated by Von Graefe in 1857, when he first performed iridectomy. This operation has withstood the test of time in cases of acute glaucoma and to a lesser degree in those of the chronic congestive form. However, for noncongestive and chronic simple glaucoma it has more often proved valueless and indeed harmful except in those cases of imperfect healing which happened to result in a filtering scar. Such accidentally filtering scars led, in the course of time, to the development of the purposeful filtration type of operation. It was not, however, until 1903, when the subject of fistula formation was again brought up by Herbert, that major advances were made by Holth (iridencleisis, 1906), Borthen (iridotasis, 1909), Schloesser (sclerotomy with iris inclusion, which he practiced as early as 1904), Lagrange (iridosclerectomy, 1905), and Elliot, who in 1909 was the first to systematize and perform in large numbers the trephining operation. These external filtering operations, with their promise of saving sight, were received with great interest and enthusiasm 30 years ago at a time when many patients with chronic glaucoma were going blind because of the inefficacy of treatment with miotics or iridectomy. After the first period of enthusiasm, critics and antagonists of the filtering operations appeared in increasing numbers. It became apparent that not only were the operations frequently unsuccessful in reducing tension, but also that in not a few of the successful cases cataracts later developed, or pupillary membranes. Other eyes were lost through late infection and some even developed sympathetic ophthalmia. It was at this time that Heine[1] published his operation of cyclodialysis, which was intended to establish internal drainage and to avoid the dangers of the external filtering operations. Cyclodialysis is, however, also far from satisfactory, inasmuch as its action is sometimes insufficient and the operation must, therefore, be repeated. Occasionally it is excessive, causing hypotony with consequent formation of a cataract, or acceleration of an incipent one in the course of the following years. Other operative procedures, among which Curran's iridotomy[2] should be mentioned, have been tried but not widely accepted.

Critical survey of glaucoma operations, past and present

It is evident, then, that both external filtering operations and cyclodialysis (internal filtering) are uncertain in reducing increased intraocular pressure and that when successful in reducing pressure they are not infrequently followed in the course of years by other serious complications. These operations with their immediate and late dangers are practically the only ones in use today for chronic primary noncongestive glaucoma. The ophthalmic surgeon is duly grateful to them for saving eyes which would have been doomed to blindness only 30 years ago. Yet he cannot feel satisfied so long as these operations are uncertain in both their immediate and late results, and are attended with considerable hazards in the hands of the best operators.

Ever since it was found that Graefe's "iridectomy" with its incision near the angle of the anterior chamber was successful in relieving intraocular pressure, a large and varied number of surgical procedures have been applied empirically to the region of the angle in the hope that they, also, might reduce pressure. These attempts were so varied and numerous that it has been said that for a glaucoma operation to be effective, one merely had to do "something somewhere in the region of the angle." The possible role of an hypothetic sclerosis of the sclerocorneal trabeculum as a cause of chronic glaucoma was suggested by some workers (Henderson,[18] Levinsohn,[19] and Schieck,[20] among others), but no surgical inferences were drawn. The question of whether the beneficial action of some operations for glaucoma, such as iridectomy or anterior sclerotomy, might be due to the severance of the trabeculae, has up to the present remained a matter of pure conjecture. Such anatomic evidence as was available argued against the idea, for Priestley Smith[21] found the incision of iridectomy to have passed completely anterior to the trabeculae in all enucleated eyes examined by him. De Wecker[22] felt that when it reduced pressure his anterior sclerotomy did so through the formation of a cystoid scar in the sclera and that its pressure-reducing effect was in no relation to the trabeculae or to Schlemm's canal. De Vincentiis[23] in 1892 reported his operation of "incision of the iridic angle," and tried it in many varieties of glaucoma, reporting some excellent results. Valude and Duclos[24] spoke of it as a "débridement" of the angle; both apparently labored under the impression that peripheral adhesions of the iris or other tissues that were blocking the filtration angle had to be removed. The polemic which arose between De Vincentiis and De Wecker on the subject of "internal sclerotomy" proves, in the light of recent observations, how deficient was their interpretation of the action of their respective procedures. It would seem that this procedure has almost without exception fallen into disuse. Czermak,[25] Meller,[26] and others described De Vincentiis's operation in their textbooks. Czermak pointed out that he has had no personal experience with it. Meller* stated that E. Fuchs occasionally used it in hydrophthalmus to avoid the dangers of iridectomy. In his textbook, Meller's indications for the operation are given as hydrophthalmus, and hemmorrhagic and occasionally cyclitic glaucoma. Except for the reports of Scalinci,[27] in 1900, on the results of the incision of the tissue of the iridic angle in hydrophthalmus and, in 1902, on the anatomical findings in two eyes which were experimentally operated upon in this manner before being enucleated for other reasons, I have found no mention of it in the literature since that date. To the best of my knowledge and judging by the absence of references, it has not been practiced by anyone, with the just-mentioned exceptions, for many years.

Recent special investigations

Present-day operations for glaucoma are unsatisfactory according to any surgical standard. It was for this reason that the writer began some years ago to investigate the causes of glaucoma. The results of these investigations have recently been published.[3, 4, 1]

* Personal communication.

An apparatus consisting of a binocular microscope suspended from the ceiling by means of a semirigid and flexible arrangement was devised. With excellent illumination from a Vogt carbon slitlamp and with the use of the Koeppe eye-adhesion glass (contact glass for investigations of the angle of the anterior chamber), it was possible to do slitlamp biomicroscopy of the angle of the anterior chamber with perfect ease. A study of the literature on the subject of the angle of the anterior chamber and its examination in the living (gonioscopy), as revealed in the excellent pioneer work of Salzmann,[6] Trantas,[7] Troncoso,[8] Koeppe,[10] Thorburn,[11] Werner,[12] Ascher,[13] Bruce,[14] Castroviejo,[15] among others, showed that not a little confusion in terminology existed and that sometimes drawings and plates were misleading. The problem of identifying landmarks with the improved technique and of interpreting the physiology and anatomy of the region was, therefore, first attacked.[3] On further investigation it proved possible to recognize and study the details of the sclerocorneal trabeculum and sometimes to see the inner wall of Schlemm's canal throughout its circumference. Such clarity and detail of this view was impossible to obtain with any of the former methods.

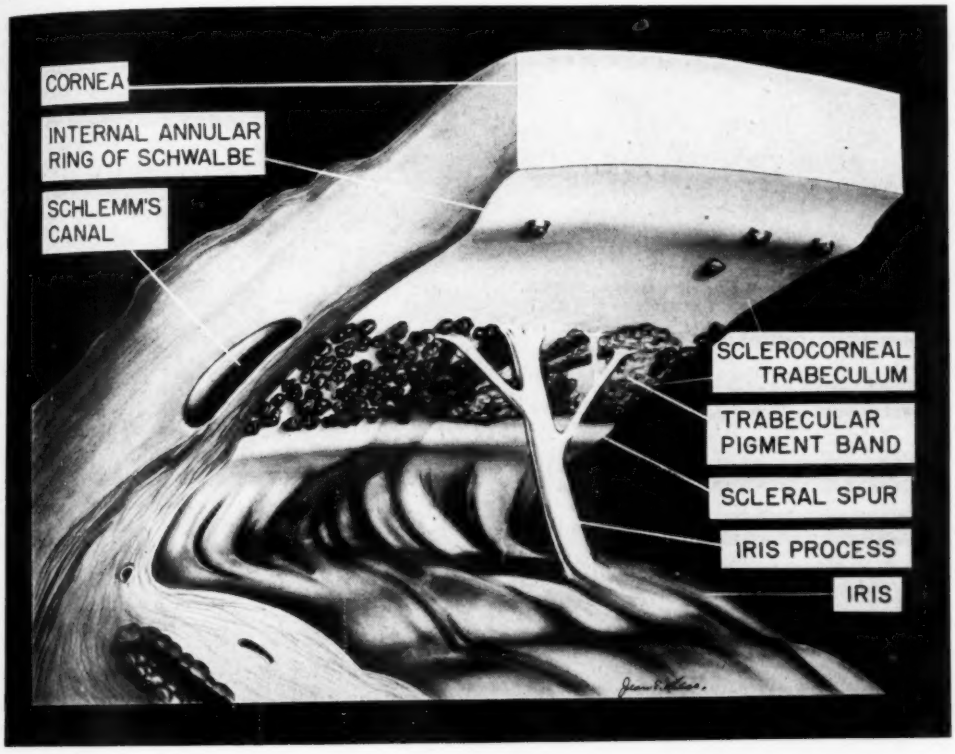


Fig. 1 (Otto Barkan). Chronic noncongestive glaucoma type 1. Schematic drawing showing open angle of the anterior chamber and blockage of the sclerocorneal trabeculum.

Such elaborate apparatus is not necessary for quick orientation in the course of clinical examination. For this purpose it is sufficient to use a hand lens or a head loupe instead of the binocular microscope. A hand slitlamp or other form of light held in the hand may suffice for focal illumination.

The depth of the angle of the anterior chamber

During the investigations in which the mode of action of cyclodialysis[5] and other operations was studied, the depth

of the anterior chamber was routinely measured. This was done with a vernier or movable scale attached to the binocular microscope. It is an accessory that does not in the least encumber the slitlamp-microscope unit and is always at hand for anterior-chamber readings. The readings have been found clinically reliable when a standard was used

chronic primary glaucoma is due to obstruction of outflow of aqueous from the anterior chamber into Schlemm's canal. This obstruction is located in the sclerocorneal trabeculum. When this normally pervious septum, which separates the lumen of Schlemm's canal from the anterior chamber, becomes impervious or sclerosed, increased pres-

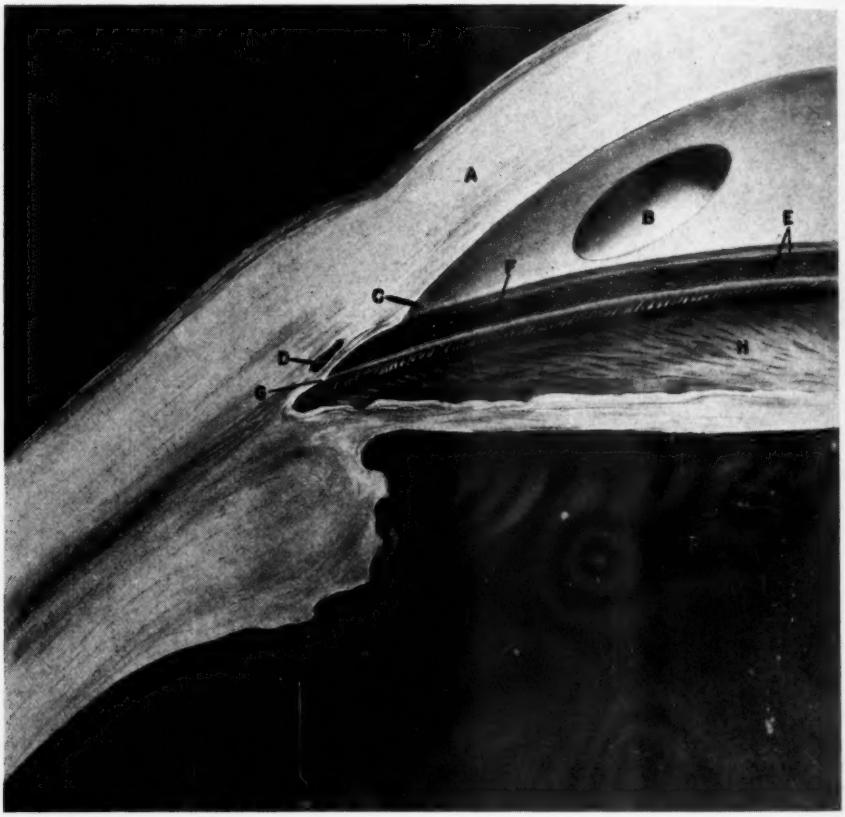


Fig. 2 (Otto Barkan). The effect of a trephining operation. A, cornea; B, trephine; C, internal annular ring of Schwalbe; D, Schlemm's canal; E, Sclerocorneal trabeculum; F, trabecular pigment band; G, scleral spur; H, iris.

based on many observations in normal eyes.

The cause of increased intraocular pressure in chronic primary glaucoma (and in some cases of chronic secondary glaucoma)

The writer has recently maintained[4] and is now able to prove that the increased intraocular pressure in over one half of all cases of noncongestive

sure results through retention of aqueous. The amount of increase may vary anywhere from slightly above normal to the highest degree of hypertension. This type of glaucoma is, as will be shown below, a true "retention" glaucoma just as increased intracranial pressure may be due to retention of spinal fluid (hydrocephalus) caused by a block of outflow in the leptomeninges or in the ventricular system. In these cases

of retention glaucoma, corneoscleral trephining and all other external filtering operations, as well as cyclodialysis (which may be regarded as an internal trephining) are, like a decompression operation (or trephining) of the skull, purely palliative. They are a confession of inability to remove the actual cause of the increased pressure.

sclerosis, with or without deposition of pigment. There is usually present, however, a dark band of pigment granules whose position corresponds exactly to that part of the trabeculum which covers Schlemm's canal. The trabeculum has become impervious. As the pores between the trabeculae are diminished in size they become plugged with pig-

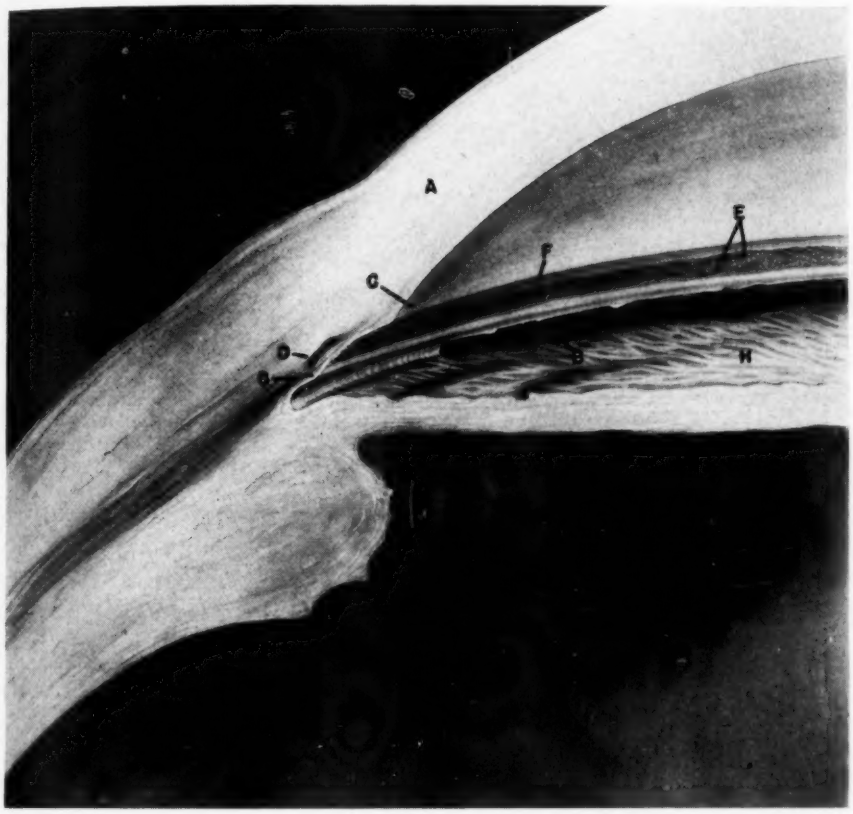


Fig. 3 (Otto Barkan). The effect of cyclodialysis. A, cornea; B, cleft showing communication between anterior chamber and suprachoroidal space; C, internal annular ring of Schwalbe; D, Schlemm's canal; E, sclerocorneal trabeculum; F, trabecular pigment band; G, scleral spur; H, iris.

It was further found that chronic glaucoma may be divided into two great types:

Type 1: The majority of chronic-non-congestive-glaucoma cases belong to this type. It shows an open angle and absence of peripheral adhesions of the iris to the wall (figs. 1, 2, 3). The anterior-chamber depth is normal or only slightly reduced. The inner wall of Schlemm's canal (trabeculum) shows ment granules, a conglomeration of which then becomes apparent as the dark band just mentioned. There seems also to be an excessive exfoliation of iris pigment. This type is true retention glaucoma due to a "sclerosis" or thickening of the trabeculum separating Schlemm's canal from the anterior chamber, and to a plugging of its pores with pigment. Since the angle is open and access to the wall of Schlemm's

canal is free, it is apparent that miotics reduce tension in this type of glaucoma through neurogenic or vascular action rather than mechanically by changing the configuration of the angle. Mild mydriatics may, therefore, be used with safety, in this type.

Werner[12] found that 79 percent of all chronic or simple noncongestive cases showed an open angle upon gonioscopic examination; Thorburn[11] 75 percent; Troncoso[9] 55 percent. My own clinical experience corresponds to these findings and I feel that 60 percent, and probably even a greater percentage of noncongestive-chronic-glaucoma cases, show an open angle and therefore belong to this great type 1.

In this type are included all open-angle cases irrespective of the amount of increased intraocular pressure and of whether the process began primarily as a narrowing of the pores or as a blocking of them with particulate matter. The latter is probably the case in Vogt's Glaucoma chronicum capsulo-lenticulare (exfoliation of the lens capsule). Here I have found capsular shreds on Descemet's membrane, and in the angle, where they have drifted and become adherent to the trabecular wall. They occasionally hang from it like minute stalactites. The dark pigment band is also present in these cases. It is apparent that one is here entering a transition zone of cases which it has been customary, up to the present, to divide sharply into the two categories of primary and secondary glaucoma, according to whether or not recognizable

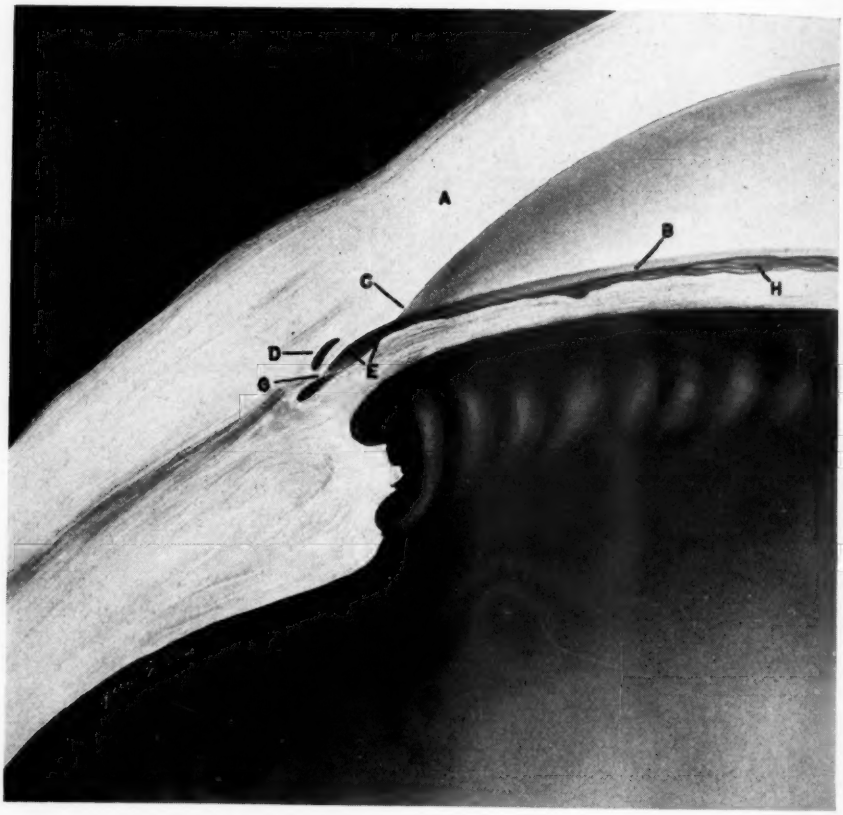


Fig. 4 (Otto Barkan). The anterior-chamber angle in chronic noncongestive glaucoma type 2. A, cornea; B, narrow slitlike entrance to the angle. C, internal annular ring of Schwalbe; D, Schlemm's canal; E, sclerocorneal trabeculum; G, scleral spur; H, iris, anterior surface.

changes of other disease were present. The writer's classification depends upon approaching the problem from the mechanical, physiological, and surgical points of view, for this would seem at the present time to give the greatest promise of solving the clinical problem of glaucoma.

Type 2: This type shows a shallow anterior chamber due to advance of the iris-lens diaphragm and ballooning of the iris (fig. 4). Biomicroscopic examination (microgonioscopy) shows the entrance of the angle to be narrowed to such a degree that only a moderate dilation of the pupil, as, for instance, through mild mydriatics or psychogenic causes, would result in its closure by the root of the iris with consequent increase in intraocular pressure. Miotics keep the entrance of the angle open. The action of miotics in this second type is, therefore, largely mechanical in that they prevent blockage of the entrance to the angle by pulling the iris away from it.

It is not within the scope of this paper to enter into the possible relationship of these two types of glaucoma, the one to the other. This has been touched upon in another article.[4] Suffice it to say that it is highly important to separate them from one another, both clinically and surgically.

Role of the trabeculum in present-day glaucoma operations

Biomicroscopy (or binocular microgonioscopy) of successfully cyclodialized eyes shows that the success of this operation is due to the formation of a communication between the anterior chamber and the suprachoroidal space, as was Heine's original intention.*,[5, 16, 17] The newly created channel for filtration between the anterior chamber and the suprachoroidal space passes posterior to Schlemm's canal and leaves the trabeculum or inner wall of the canal untouched (fig. 3). In the successful trephine operation (fig. 2) the trabeculum is likewise left untouched, since the opening is always placed anterior to the trabeculum, as it also is in iridencleisis and other external filtering operations.

It is quite apparent then that the obstruction which is the actual cause of the increased intraocular pressure in chronic noncongestive glaucoma type 1 (simplex), namely, the impervious trabeculum, is not touched by any of the present-day operations for glaucoma.

It is furthermore evident that this statement also holds true for that form of congestive glaucoma which is the late or decompensated stage of the simple or noncongestive type 1. This decompensated or congestive stage is associated with the development of peripheral adhesions of the iris which in themselves constitute an additional block to the outflow of aqueous; the adhesions probably also cause kinking of the iris with resultant obstruction of venous outflow and increased transudation.

Conclusions on the mechanical etiology of chronic glaucoma confirmed by incising the trabeculum and opening Schlemm's canal

As the trabeculum, which is so readily visible with the biomicroscopic technique to be described later, and in which it seemed certain was situated the actual block to the outflow of aqueous, is left untouched by all types of operations in use today for chronic noncongestive glaucoma, it occurred to me to divide the obstructing trabeculum by incising it from within the eyeball, thereby reopening the natural channels for aqueous outflow. In other words, instead of making an artificial drain or channel for the outflow of aqueous to the exterior (trephining and other external filtering operations) or an artificial one to the interior (cyclodialysis) it seemed better in every way *to restore the physiological pathway from the anterior chamber into Schlemm's canal by means of an incision of the obstructing trabeculum or septum* which sepa-

* The author has recently come into possession of an eye successfully operated on by cyclodialysis, this being the only other specimen of its kind since the unique one reported by Elschnig. The results of microscopic examination of it, which will be published in the near future, offer further evidence in support of the view that the action of cyclodialysis is due to internal drainage into the suprachoroidal space.

rates the two (fig. 5). This operation was performed in ten cases reported below and was completely successful in every case where it was indicated, but one.*

The first seven patients were operated upon with the technique of De Vincentiis, before the surgical contact glass and the method of operating under direct vision had been devised. After making the puncture in the temporal limbus the knife traversed the chamber until its blade disappeared from view behind the nasal limbus. The blade of the knife was inserted in the angle wall 1½ to 2 mm. posterior to the limbal margin as judged on the outer side of the eyeball and was slowly swept around the lower and inner circumference of the limbus. Neither the blade nor the contents of the angle of the anterior chamber were visible to the surgeon during the operation. He was, actually, operating blindly or semiblindly. Consequently, the blade might cut into the ciliary body (it could easily slip behind the scleral spur and cause a major hemorrhage) or arrive in the cornea where it would be ineffective. One must recall that the angle is but one millimeter in breadth by actual measurement; for surgical purposes it is even less, inasmuch as its plane is quite oblique to the plane of the knife and much foreshortened in relation to the surgeon. As the incision was hidden underneath the opaque limbus, it would seem a priori hardly feasible to place it correctly in a majority of cases. Yet, surprisingly enough, postoperative biomicroscopy showed this to have occurred in all but one case (six out of seven) in which the operation was done by this method. In all but one Schlemm's canal was struck and opened over a sufficient extent to reduce pressure. In a few the knife went too far posteriorly during a small part of the incision and caused a detachment of the iris root with moderate bleeding. This occurred in the one case mentioned above in which a marked hemorrhage into the anterior chamber took place. The increased pressure remained unchanged. Such complications are avoided with the new technique (about to be described) which enables the surgeon to operate under direct magnified vision.

*This eye (which had been trephined elsewhere without success two years previously) was operated on in the first series of seven cases, before the surgical contact glass and the method of operating under direct magnified vision had been developed. Three patients were operated upon with the latter technique, all successfully.

Operation on Schlemm's canal under direct magnified vision

As the result of recent researches, the writer has developed a surgical contact glass which enables him to operate on Schlemm's canal with this region in full view. *The construction of the surgical contact glass** is such as to make it possible to fix the eyeball, to insert a specially designed knife and to guide its blade in the region of the wall of the angle while both blade and angle are under full view and magnification. That is, the obstructed inner wall of Schlemm's canal (the trabecular pigment band which the writer has proved to be the mechanical cause of the increased intraocular pressure) is incised under binocular and magnified direct vision. The physiologic and anatomic pathway for the outflow of aqueous from the anterior chamber into Schlemm's canal is thus restored.*

By means of this technique of operating under direct vision, a perfect placement of the incision is secured; the hazards of missing the canal by placing the incision too far anterior or posterior and thereby cutting into the ciliary body with resultant hemorrhage are almost completely eliminated.

Technique of operation. The eye is prepared in the usual way for intraocular surgery. The conjunctival sac is thoroughly cleansed of all secretion or material that might tend to render turbid the physiological saline solution that will be placed between the cornea and the contact glass. The glass must be scrupulously clean to insure perfect visibility. After heat sterilization, the glass is passed through alcohol and

** This recently developed surgical contact glass is being further perfected at the present time and will be described in a seporate article in the near future.

water. The eyelashes of the temporal third of both lids are clipped. Akinesis of the lids is induced by the Van Lint method. Local anesthesia is induced by the instillation of a 1-percent solution of pantocaine in the previously weak-eserinized eye; lid sutures may be inserted or a blepharostat used to hold the lids apart. The surgical contact glass is applied and sterile physiological saline solution at body temperature is injected with a 1-c.c. Luer syringe and delicate curved canula under the temporal margin of the glass while the eye is rotated nasally.

During the operation the surgeon sits on a stool facing the patient's temple with his head a little higher than that of the patient. In this way he is in line with the patient's temporal limbus and also in a position to observe the angle of the anterior chamber through the contact glass. The assistants stand. With the contact glass alone a ×1½ magnified picture of the angle is obtained. For the purpose of the operation it has been found most convenient to increase this magnification about ×2, by means of a head loupe. The most suitable method of illumination has up to the present proved to be a hand slit-lamp held temporally and above for the right eye and temporally and below for the left, combined with a very strong overhead lamp that also serves slightly to transilluminate the angle wall from the nasal side.

The gaze of the patient is directed toward the ceiling. One assistant fixes the contact glass by pressing slightly on the depression in its convex surface with rod or probe. The glass is so placed as to expose the temporal limbus and the second assistant wipes its anterior surface with applicators in order to insure good visibility for the surgeon. The latter fixes the sclera with a small Elschnig forceps in his left hand. Iodine is applied to the limbus at the intended point of puncture. With his right hand he pierces the temporal limbus with a specially designed knife,* passes it across the chamber, and deliberately inserts it into the trabeculum which is under full view on the other side of the anterior chamber. The dark trabecular pigment band is sufficiently distinct to act as a guide. The incision is continued downwards and Schlemm's canal is thus opened through one fourth to one third of its extent, after which the knife is quickly withdrawn without loss of aqueous. The contact glass is then removed and monocular occlusion applied.

After the operation eserine is instilled for several days in order to keep the stromal surface of the iris from forming adhesions with the opening in Schlemm's canal. The patient suffers no pain nor discomfort and it is remarkable to note the normal appearance of the eye and the brilliant luster of the cornea the day after the operation.

Postoperative biomicroscopic examination of the angle

Postoperative biomicroscopic examination of the angle within a period of two or three weeks shows the obstructing trabeculum to have been divided throughout a varying part of its extent (fig. 5). In some cases, a wide rent is observed, in others a slitlike opening. As all eyes operated upon under the contact glass show the opening of Schlemm's canal in the absence of any other anatomic change, it seems evident that this is the sole reason for the normalization of the intraocular pressure. The operation leaves the outward appearance of the eye unchanged.

Permanence of results

One question remains to be answered —is the normalization of intraocular pressure permanent? The pressure has remained normalized in all cases in which Schlemm's canal was opened since the first operation of 10 months ago. The postoperative appearance of the opening of Schlemm's canal has remained unchanged. There seems to be, therefore, no tendency to scar formation or closure. This is, perhaps, what one would expect when one considers nature's tendency to maintain the physiological pathway in the case of secretory

* The knife may be procured from Mueller & Co.

or excretory ducts; as, for instance, in the case of fistulae of the salivary or common bile duct or of the ureter. The fistula closes as soon as the obstruction in the duct is relieved. The physiological pathway is preferred and maintained. One should also bear in mind the tendency of a longitudinal incision of a vessel to gape; this would more especially obtain in the case of the elastic trabeculae and may be further encouraged by the pull of the ciliary muscle on the scleral spur. Perhaps also the aqueous may inhibit the formation of scar tissue.

Judging from analogy, there seems then to be no reason why the elimination of aqueous through the opening in Schlemm's canal should not continue permanently, as it has done during the past several months. Only the passage of years can conclusively answer this question. It is conceivable that the communication which the operation has established between the anterior chamber and Schlemm's canal might eventually close or that, in the absence of a normal trabeculum, one of whose physiological functions it is to act as a sieve, particulate matter entering Schlemm's canal might block its emissaries (collector channels)[28] through which the aqueous is eliminated into the intrascleral venous plexus. Personal observations and clinical experience make this eventuality appear improbable. But if, for some unforeseen reason, the outflow through the surgically restored outlet should indeed become obstructed in the course of years, a second operation could with equal ease be performed

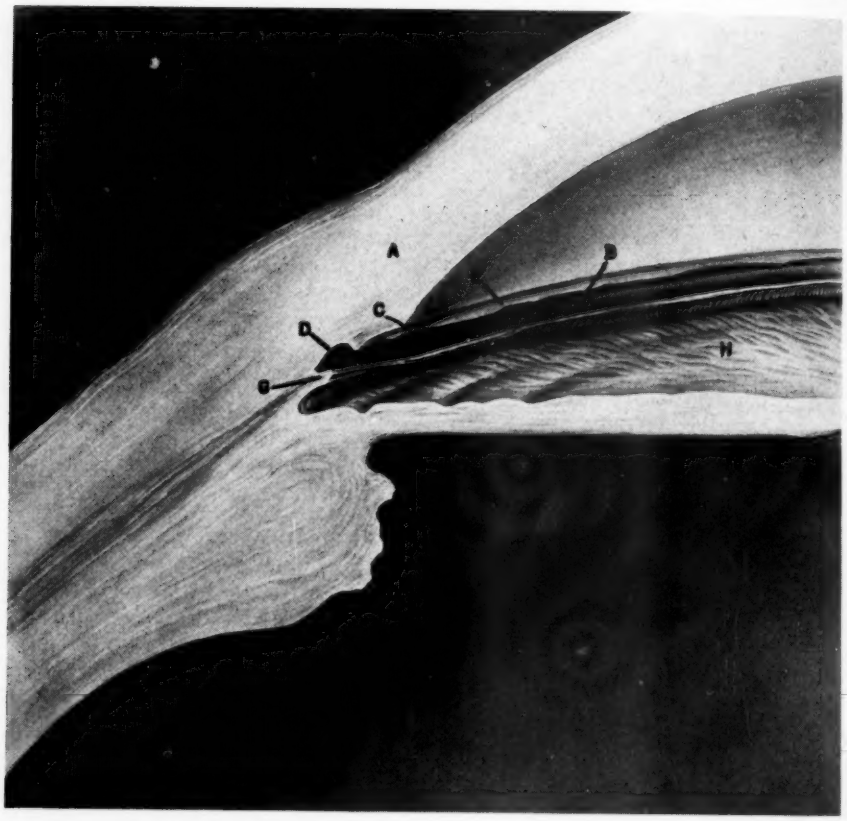


Fig. 5 (Otto Barkan). The effect of the author's operation: Incision of Schlemm's canal (goniotomy). A, cornea; B, opening of Schlemm's canal, restoration of physiological outlet; C, internal annular ring of Schwalbe; D, Schlemm's canal; E, sclerocorneal trabeculum; G, scleral spur; H, iris.

on another sector of the circumference of Schlemm's canal and no doubt with the same good result. It is interesting to recall in this connection the pathologic anatomic fact that the lumen of Schlemm's canal remains patent into the last stages of absolute glaucoma. This fact is confirmed by my investigations and is shown to have the greatest surgical significance. In other words, the block of the outflow of aqueous is situated in the wall of Schlemm's canal and not in the canal itself. Hence, the possibility of reëstablishing outflow and normalizing intraocular pressure remains even in the latest stages of glaucoma.

The further scope and other advantages of the new operation under the surgical contact glass will be dealt with in another article. May it suffice merely to mention here that in many cases, judging by present experience, the continued use of miotics will prove unnecessary; that the operation is equally successful in certain cases of secondary glaucoma, which are in part or wholly due to sclerosis or blocking of the trabeculum; and that its lack of hazard is particularly gratifying in late cases of unilateral glaucoma.

Case reports

Case 1. Mr. W. M. M., aged 55 years, was seen August 9, 1935. For six months he had had occasional foggy vision and haloes. Vision was R.E. 1.0 and J 1; L.E. fingers at 3 feet. The depth of the anterior chamber measured 1.7 mm. The fundi showed a glaucomatous excavation of the optic discs in both eyes, in the left greater than in the right. Tension (McLean) of the right eye was 38 mm. Hg, of the left 50 under 1-percent pilocarpine (every three hours).

Microgonioscopy showed chronic glaucoma, type 1.

Operation August 13, 1935, on the left eye, was an incision of Schlemm's canal (goniotomy) without the surgical contact glass. Next morning the tension was 18, the cornea brilliant, and the eye comfortable.

Postoperative microgonioscopy on October 19th, showed Schlemm's canal opened between the 4:00- and 6:30-o'clock position. Within this area were two adhesions of iris stroma to the wound lips of Schlemm's canal. Thus only a small portion of the total circumference of the canal was in communication with the anterior chamber. Peripheral adhesions of iris must have been the result of loss of aqueous during the operation when the stroma of the iris came into contact with the incision of Schlemm's canal and remained adherent to it, for in no other case after this first one did such peripheral adhesions occur. On November 25th, tension in the right eye was 40, in the left eye 30 mm. Hg. The last drop of pilocarpine had been given two hours before. The visual field in the left eye had improved and vision increased to 1/10 eccentric and J 7. On May 1, 1936, tension in the right eye was 45, in the left eye 30 mm. Hg (under pilocarpine).

Summary: A small incision of Schlemm's canal in the left eye reduced the tension from 50 to 30 mm. (both readings under pilocarpine). Last observation was made 10 months after operation. (Hemorrhage and loss of anterior chamber did not occur in later cases in which the operation was conducted under the surgical contact glass.)

Case 2. Mr. E. L. W., aged 49 years, presented himself in January, 1936, nervous and apprehensive, complaining of a subjectively enlarged blind spot in the left eye and of other subjective symptoms. Tension in the right eye was 22, left eye 30 mm. Excavation of the left optic disc was marginal through one half of its circumference. After the administration of ⅛-percent pilocarpine, the tension was right eye 25, left eye 26 mm. The visual field of the left eye showed a Bjerrum scotoma approaching the point of fixation.

Microgonioscopy showed the angle of the anterior chamber to be normal in the right eye, whereas the left eye showed a pronounced dark pigment band over Schlemm's canal; the angle was open. The left eye, therefore, belonged to chronic glaucoma, type 1. The need of regular instillation of miotics was explained. The patient, who was of a high order of intelligence but nervously unstable, refused to consider using miotics for the rest of his life and demanded an operation such as would relieve the pressure without undue hazard.

Operation. On January 26, 1936, an incision was made in Schlemm's canal (goniotomy) of the left eye extending through one third of its circumference. The tension before operation was right eye 25, left eye 28 (both eyes under pilocarpine). Two days after the operation the tension in the right eye was 28, in the left eye 5 mm. (without pilocarpine). On January 30th the tension in the right eye was 20, in the left eye 10; on February 10th, tension R.E. 25, L.E. 11; on February 14th, tension R.E. 24, L.E. 15; on April 20th, tension R.E. 22, L.E. 20 mm. (without pilocarpine).

Postoperative microgonioscopy after three months showed Schlemm's canal to be opened from the 4:30- to the 8:00-o'clock position.

Summary: Tension in the left eye was reduced to within the limits of what is normal for this patient; progressive loss of function, which had been definite before operation, has been arrested during a period of observation of four months after operation, without the use of drops.

Case 3. Mr. G. L., aged 68 years, had a bilateral chronic noncongestive glaucoma. In 1924, iridectomy in the right eye normalized tension to 38 mm. Hg (McLean). Tension in the left eye was 52 under 1-percent pilocarpine. Vision in the right eye was ability to count fingers, in the left eye 1.0 and J 1. In 1925, iridencleisis in the left eye reduced tension to 20 mm. In January, 1935, tension was right eye 30, left eye 25. During 1935 tension in the right eye increased to 50 mm. in spite of miotics and there was a gradual loss of visual field.

Microgonioscopy showed a chronic glaucoma, type 1.

Operation on the right eye, October 22, 1935, was an incision of Schlemm's canal (goniotomy). On May 1, 1936, tension in the right eye was 27, in the left eye 25 mm. Hg.

Summary: Tension in the left eye of 50 mm. Hg was reduced to 25; the period of observation was six months.

Case 4. Mrs. N. N., aged 62 years, presented herself on October 30, 1933, giving a history of gradual loss of vision in the right eye during the last 9 years, and in the left eye increasingly foggy vision for 8 years. Vision in the right eye was amaurosis, in the left eye 0.3 and J 5. Tension under 2-percent pilocarpine was R. 75, L. 50 mm.; there was a Bjerrum scotoma; and the optic discs showed glaucomatous excavation with atrophy.

Microgonioscopy showed chronic glaucoma, type 1. An operation was advised but refused. The patient was next seen on February 10, 1936, when vision bilaterally was amaurosis, tension R. +3, L. 130 mm. Hg (McLean). The left eye showed moderate caput medusae, deep anterior chamber, and iridodonesis. After an instillation of 1-percent eserine tension in the left eye was 90 mm.

Operation was performed on February 11, 1936, an incision of Schlemm's canal (goniotomy) from the 9:00- to the 6:00-o'clock position. On February 14th the tension in the left eye was 28 mm. (with pilocarpine); on February 28th, 18 (without drops); on April 24, 1936, 24 (without drops).

Summary: In a case of absolute glaucoma tension was reduced from 90 to 28 mm. Hg. The last observation was made two months after operation.

Case 5. Mr. M. L., aged 65 years, was first seen on July 22, 1935. The right eye, blind from glaucoma since 1930, had been enucleated in 1932. Vision in the left eye was 1.0 and J 1. He had been seeing haloes in this eye for two months. Tension was 70 mm. Hg under 1-percent pilocarpine (given at three-hour intervals). On August 29, 1935, the tension was 120 in spite of 0.5-percent eserine.

Microgonioscopy showed chronic glaucoma, type 1.

Operation. On August 30, 1935, an incision of Schlemm's canal (goniotomy) was made. On November 5th, tension was 26 (without drops); on April 4, 1936, it was 35 mm. (last drop of pilocarpine 4 hours previously).

Summary: Tension was reduced from 120 to 35 in a case of unilateral glaucoma. The time of observation was eight months.

Case 6. Mrs. K. B., aged 64 years appeared for treatment on March 5, 1936, because of secondary glaucoma in the right eye following an injury while hammering on metal 12 years before. This eye showed traces of a perforating injury with minute foreign bodies. A corneal scar, hole in the iris, posterior cortical cataract, and total excavation of optic nerve with atrophy were found at examination. X-ray films were negative. Vision in the right eye was hand movements in the temporal field, in the left eye 1.0 and J 1. Tension in the right eye was 110, in the left 32 mm. The slitlamp showed pigment dust on Descemet's membrane.

Microgonioscopy showed a porcelainlike appearance of the corneoscleral trabeculum denoting blockage.

At operation, March 6, 1936, an incision of Schlemm's canal was made (goniotomy). On March 17, 1936, a slight iridocyclitis was relieved by local treatment. On May 13, 1936, tension in the right eye was 27, in the left eye 33 mm. Hg (without drops).

Summary: In a case of secondary glaucoma, following perforating injury, tension was reduced from 110 to 27 mm. Hg. The period of observation was two-and-one-half months.

Case 7. Mr. L. P. L., aged 69 years, was seen on March 4, 1936. Both eyes had been trephined for chronic simple glaucoma elsewhere in 1932. Vision in the right eye was 0.3 and J 4, in the left eye 0.1 and J 4. There were posterior cortical cataracts. Tension in the right eye was 30, in the left 50 mm. Hg under pilocarpine.

Microgonioscopy showed the iris adherent to the inner trephine opening. In the left eye the latter was also covered by a membrane; the remaining angle was open and showed moderate sclerosis and pigmentation of the trabeculum.

Operation on March 19, 1936, was an incision of Schlemm's canal (goniotomy) without the surgical contact glass. Two days after the operation, following a vomiting spell, the patient complained of pain in the left eye and the anterior chamber was found to be full of blood. The tension was 80 mm. Hg. On June 5, 1936, three months thereafter, the tension in the right eye was 30, in the left eye 45 mm. Hg. Vision in the right eye was 0.3 and J 2, in the left eye 0.1 and J 3 eccentric, unchanged.

Summary: A secondary hemorrhage into the anterior chamber resulted in a protracted convalescence and no benefit from the operation. Probably a vessel was eroded at the time of operation. This cannot occur with the new technique of operating under direct magnified vision with the surgical contact glass.

Case 8. Mr. J. H. P. was seen on November 18, 1935. An intraocular bit of steel had been extracted from the left eye 10 years previously. This eye had been aching for

three weeks. Vision in the right eye was 1.0 and J 1, in the left eye amaurosis. The X-ray examination was now negative. Tension in the right eye was 30 and in the left eye 100 mm. Hg.

Microgonioscopy showed sclerosis of the corneoscleral trabeculum.

At operation an incision of Schlemm's canal was made (goniotomy). On November 22, 1935, the tension in the right eye was 30, in the left 32 mm. Hg.

Summary: In a case of secondary glaucoma subsequent to intraocular steel, 10 years previously, tension was reduced from 100 to 32 mm. Hg. The period of observation was one week. The patient reported by letter that his eye has been comfortable and unchanged since his last visit.

Case 9. Mr. A. B., aged 26 years, had been struck in the left eye by a rock 15 years previously. Recurring attacks of supraorbital pain of increasing intensity had been suffered for the last several weeks. Enucleation had been advised elsewhere. Vision in the left eye was light perception, no projection, in the right eye 1.0 and J 1. Tension in the right eye was 30, in the left eye 65 mm. Hg.

Microgonioscopy showed iridodialysis from the 3:00- to the 4:30-o'clock position; peripheral adhesion of iris (scleral) from 4:30 to 7:00 o'clock and the rest of the angle open and showing a definite sclerosis of the corneoscleral trabeculum, with pigment dust sprinkled over it.

Operation, February 28, 1936, on the left eye was an incision of Schlemm's canal (goniotomy) from the 11:00- to the 8:00-o'clock position. On February 29th, the tension was R. 20 mm. and L. 23; on March 27th R. 25, L. 10 mm. This operation was conducted under the surgical contact glass.

Summary: In a case of secondary glaucoma, posttraumatic with aphakia, tension in the left eye was reduced from 65 with drops to 10 mm. Hg without drops. The period of observation was four weeks.

Case 10. Mrs. F. F., aged 68 years, was seen on March 9, 1936, presenting a case of glaucoma lenticulo-capsulare (Vogt) or chronic glaucoma with exfoliation of the lens capsule. Vision in the right eye was 0.8 and J 1, in the left eye 1.0 and J 1. The tension (McLean) R. was 65 mm. Hg, L. 45, under pilocarpine. Enlargement of blind spot and progressive excavation of the optic discs, greater on the right than on the left, were noted.

Microgonioscopy showed chronic glaucoma, type 1.

Operation was performed on May 16, 1936, an incision of Schlemm's canal (goniotomy). On June 18, 1936, tension R. was 35, L. 33; on June 26, 1936, R. 35, L. 35 (under pilocarpine). The operation was conducted under a surgical contact glass.

Summary: In a case of chronic glaucoma, type 1, with exfoliation of the lens capsule, tension in the right eye was reduced from 65 to 35 mm. Hg. The period of observation was six weeks.

Case 11. Mr. E. P., aged 70 years, was seen on April 29, 1936, complaining of gradual failure of vision, greater in the left than in the right eye, for one year. Vision in the right eye was 0.6 and J 1, in the left eye finger counting. The visual field was contracted in the left eye. Tension R. was 32, L. 40 mm. Hg under pilocarpine.

Microgonioscopy showed chronic glaucoma, type 1, with exfoliation of lens capsule.

Operation on May 15, 1936, was an incision of Schlemm's canal (goniotomy). On June 19th, tension R. was 35, L. 15 mm. Hg (pilocarpine R.E. only). The operation was performed under surgical contact glass.

Summary: In a case of chronic glaucoma with exfoliation of the lens capsule, tension in the left eye was reduced from 40 with pilocarpine to 20 mm. Hg without pilocarpine. The period of observation was five weeks.

Conclusions

A new surgical procedure for the relief of chronic glaucoma, which consists of opening Schlemm's canal under direct magnified vision, is herewith reported. It would seem to be the rational technique for the relief of a disease which is the commonest cause of blindness in middle or later life. It is indicated in what has here been classified as type-1 primary chronic glaucoma. This type includes over 50 percent of all chronic noncongestive cases, and may prove to include an even considerably higher percentage. In this type, judging from my experience to date, the properly performed operation under a specially devised surgical contact glass is without danger and its results promise to be permanent. It is also indicated and equally successful in certain cases of secondary glaucoma, the operability of which may be definitely ascertained by preoperative biomicroscopic examination. Its simplicity, preoperative predictability of outcome, and its certainty of success in indicated cases are such as to make it appear an ideal procedure. It is particularly gratifying in the following conditions:

(1) In all cases of type-1 chronic glaucoma, in which it is indicated as the only rational procedure because it restores the physiological function of Schlemm's canal with a minimum of trauma, and with an absence of hazard, in contrast with attempts to establish permanent artificial drainage, as in

present-day operations for glaucoma with their well-known disadvantages and dangers.

(2) In early cases in which the patient cannot be relied upon to use miotics regularly nor to keep in regular touch with an ophthalmologist.

(3) In cases which run a nocturnal or early morning hypertension in spite of the use of miotics. In such cases normalization of tension throughout the 24 hours is often essential to the preservation of function.

(4) In late cases, in which only a small amount of field of vision is left and the other eye is already blind. In these desperate cases it is equally effective and, because of its lack of danger, especially indicated.

(5) In absolute glaucoma, regarded by most ophthalmologists as a "noli me tangere," provided the angle is open.

In this operation there is no danger of late infection, there being no communication with the outside; no danger of internal hemorrhage, as the incision can be properly placed under direct vision to avoid the vessels of the ciliary body; no danger of prolapse of parts; no danger of sudden reduction of pressure immediately following the operation, inasmuch as the anterior chamber is retained or at least practically no aqueous is lost; and no danger of a return of the increased intraocular pressure. According to my experience to date, this operation does away with the immediate and late dangers of the present-day operations and is eminently more successful in reducing pressure to normal. It would seem possible, therefore, that it may replace these operations in all cases of type-1 chronic glaucoma and in some cases of secondary glaucoma. It has already done so in my hands.

In fairness to the patient and in order not to discredit the operation, a proper biomicroscopic diagnosis of chronic glaucoma of type 1 should always be made before operating. In spite of the apparent simplicity of the operation and perhaps because of this very simplicity, one should approach it with a high degree of deliberate care. One is dealing here with a very exact form of surgery —one may indeed say with *intraocular microsurgery,* which demands a correspondingly exact knowledge of the living angle on the part of the surgeon and a preoperative examination and diagnosis with a binocular microgonioscope, in order to assure good surgical results. A note of warning must be sounded in this regard, for without preoperative biomicroscopic examination the improper selection of a case (for instance, one with peripheral adhesions, a shallow angle, or an aberrant artery of the ciliary body) may well occur and lead to serious consequences. On the other hand, when the indication for operation has been properly and definitely established, I know of no intraocular operation that is so neat, smooth, and certainly effective as is this one.

Summary

It is suggested that this operation, which restores the physiological function of Schlemm's canal, solves the surgical problem of most cases of chronic primary glaucoma. It is equally successful in certain cases of secondary glaucoma. The results are predictable and appear to be permanent. It involves a new principle in the surgery of glaucoma in that the angle of the anterior chamber and Schlemm's canal are under full view and magnified during the operation. The operation is without danger when the proper technique is used and has proved completely successful in the writer's hands when certain preoperative indications (binocular biomicroscopic diagnosis) have been fulfilled.

490 Post Street.

Bibliography

[1] Heine. In Graefe-Saemisch Handbuch der Augenheilkunde, 1922, v. 1, pp. 872, 878.
[2] Curran, E. J. A new operation for glaucoma involving a new principle in the etiology and treatment of chronic primary glaucoma. Arch. of Ophth., 1920, v. 49, p. 131.
———. Peripheral iridotomy in chronic glaucoma. Trans., Sect. Ophth., Amer. Med. Assoc., 1920, p. 75.

[1] Barkan, Otto. The structure and function of the angle of the anterior chamber and Schlemm's canal. Arch. of Ophth., 1936, v. 15, January, pp. 101-110.
[2] ——, Boyle, S. F., and Maisler, S. On the genesis of glaucoma: An improved method based on slitlamp microscopy of the angle of the anterior chamber. Amer. Jour. Ophth., 1936, v. 19, March, no. 3, pp. 209-215.
[3] ——, Boyle, S. F., and Maisler, S. On the surgery of glaucoma: Mode of action of cyclodialysis. Amer. Jour. Ophth., 1936, v. 19, January, no. 1, pp. 21-25.
[4] Salzmann. Die Ophthalmoskopie der Kammerbucht. Zeit. f. Augenh., 1914, v. 31, and 1915, v. 34.
[5] Trantas. Sur la gonioscopie (Ophtalmoscopie de l'angle irido-cornéen). Arch. d'Opht., 1928, v. 45.
[6] Troncoso. Gonioscopy and its clinical applications. A gonioscopical study of anterior peripheral synechiae in primary glaucoma. Amer. Jour. Ophth., 1925, v. 8, p. 433.
[7] ——. Closure of the angle of the anterior chamber in glaucoma. Arch. of Ophth., 1935, v. 14, October, pp. 557-586.
[8] Koeppe. Ueber den derzeitigen Stand der Glaukomforschung an der Gullstrandschen Nernstspaltlampe sowie den weiteren Ausbau des Glaukoms. Frühdiagnose vermittelst dieser Untersuchungsmethode. Zeit. f. Augenh., 1918, v. 40, p. 138.
[9] Thorburn. Svenska Lak. Sallsk. Handl., 1927, v. 53, pp. 252-272; 273-291.
[10] Werner, S. Gonioscopical studies of operated cases of glaucoma. Acta Ophth., 1931, v. 9, pp. 112-116; 1932, v. 10, pp. 426-563.
[11] Ascher. Zur Mikroskopie des lebenden Auges. Klin. M. f. Augenh., 1927, v. 78, p. 628.
[12] Bruce, G. M. Vizualization of foreign bodies in the irido-corneal angle. Arch. of Ophth., 1933, v. 10, Nov., pp. 615-620.
[13] Castroviejo. Goniophotography. Photography of the angle of the anterior chamber in living animals and human subjects. Amer. Jour. Ophth., 1935, v. 18, June, no. 6.
[14] Elschnig, A. Zur Wirkungsweise der Zyklodialyse. Ber. d. Deutschen Ophth. Gesell., 1932, p. 277.
[15] Vannas, M. Zykloskopische Untersuchungen über das Verhalten des Strahlenkörpers nach der Heineschen Operation. Klin. M. f. Augenh., 1935, v. 95, p. 629.
[16] Henderson. Glaucoma. London, 1910.
[17] Levinsohn. Zur Entstehung des Glaukoms durch Pigmentinfiltration der vorderen Abflusswege des Auges. Zeit. f. Augenh., 1918, v. 40, p. 344; Arch. f. Augenh., 1908, v. 62, p. 130.
[18] Schieck. Ber. d. Ophth. Gessell., Heidelberg, 1919, v. 41, p. 68.
[19] Priestley Smith. Glaucoma, its causes, symptoms, pathology and treatment. London, 1879.
[20] de Wecker. Ann. d'Ocul., 1898, v. 119, p. 102.
[21] De Vincentiis. Sulla incisione dell'angolo irideo (Taylor). Ann. di Ottal., Pavia, 1891, v. 20, p. 92.
——. Incisione dell'angolo irideo nel glaucoma. Ann. di Ottal., Pavia, 1893, v. 22.
[22] Valude and Duclos. Du débridement de l'angle iridien. Ann. d'Ocul., 1898, v. 119, p. 98.
[23] Czermak. Die augenärztlichen Operationen. Berlin, Urban and Schwartzenberg, 1908, v. 2, p. 233.
[24] Meller, J. Augenärztliche Eingriffe. Vienna, J. Safar, 1921, p. 321.
[25] Scalinci. Ann. di Ottal., 1900, v. 29, pp. 324-335; 1902, v. 31, pp. 588-594.
[26] Dvorak-Theobald. Schlemm's canal: Its anastomoses and anatomic relations. Trans. Amer. Ophth. Soc., 1934.

Discussion. DR. G. D. THEOBALD: Is the trabecular pigment band composed of real pigment, or do the openings in the trabeculum give the appearance of darkness, as the hole in the iris gives a black pupil?

DR. O. BARKAN: The trabecular pigment band is composed as far as one can tell (under 40 linear magnification) of real pigment. The pigment of which it is composed differs slightly in appearance from the pigment granules which fall on to the angle wall below physiologically. Its color is gold-brown, and it consists of granules differing in size from that of pigment dust to pigment particles.

The pores in the trabeculum are not visible with the apparatus I am using at present. One is merely cognizant of a trabecular network or weave.

DR. THOMAS D. ALLEN: Does a high degree of intraocular tension or previous inflammation contraindicate the operation?

DR. O. BARKAN: High intraocular tension does not contraindicate the operation. The highest tension in an eye on which I have operated was 120 mm. Hg (McLean). The patient was a young

man who had secondary glaucoma following an injury some 10 years previously. The tension was reduced to around 30. I have had other cases, also, of very high tension.

Previous inflammation probably does play a role. I am not qualified to answer that question definitely. My impression, judging from the literature, and the observations, especially those made by Troncoso, is that as a result of congestive periods, or periods of compression, peripheral iris adhesions form. These would, I feel, contraindicate the operation as it is herewith described. It may be that this method should be used in such cases as well, but I have not yet operated on any patient by cutting through a peripheral iris adhesion.

DR. A. W. MCALESTER: What magnification do you use on the microscope during operation?

DR. O. BARKAN: The magnification of the contact glass, combined with the media of the eye, is about one-and-a-half times linear. During operation I have used a head loupe and a plus-two sphere fitted over my distance correction. As I am not yet manifestly presbyopic, the plus-two sphere simply enables me to get closer, so I imagine the actual magnification during the operation is from two to two-and-a-half times linear.

DR. LEO L. MAYER: Would Dr. Barkan hazard an explanation of why a trephine operation lowers and maintains lowered tension in some cases in view of his theory?

DR. O. BARKAN: The trephine operation acts, I take it, as a decompression operation does in the skull in the case of hydrocephalus, permitting drainage to the outside, but it has nothing to do with the actual obstruction that is causing the increased intraocular pressure; no more than a decompression operation of the skull has to do with the cause of hydrocephalus.

I would say, by comparison, if hydrocephalus were caused by an obstructing membrane over the aqueduct of Sylvius and it were possible by an incision to open this membrane and reëstablish communication, without hurting the patient, that would be analogous to the operation which I have described; in contradistinction is trephining, which acts as a palliative reducing operation but not as a causal one.

AN INVESTIGATION OF THE ANGULAR RELATION OF THE VISUAL (VISIERLINIE) AND OPTIC (CORNEAL) AXES OF THE EYE

GEORGE E. PARK, M.D.
CHICAGO

The visual axis has hitherto been postulated as a straight line from the point of fixation to the fovea but, in this investigation, it is apparent that, while this theoretic straight line does exist from the point of fixation to the cornea, a deviation usually takes place at the corneal surface by reason of its lack of centration on the visual axis. A further deviation appears to occur at the lens: By the action of the ciliary muscle the lens is shifted bodily or is formed into a prismatic shape by the unequal action about its margin, either or both, and this functions to bring the image of the point of fixation upon the fovea in conjunction with the action of the extrinsic muscles. This relation of the ciliary muscle and the extrinsic muscles is found to vary with adaptation, fatigue, and possibly other causes, and results in a varying relation of the visual and optic axes, previously assumed to be constant. From the Department of Ophthalmology, Northwestern University Medical School. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936.

The optic axis of the eye is readily found by observing the angular reflection at the corneal surface of an illuminated object and computing the axis by well-known formulae. But the visual axis (visierlinie) is not to be determined in this manner, for it is in no wise related either to the optic axis or to angular reflections at the corneal surface. Many investigators of ocular movements have assumed a definite relation between such angular reflections at the corneal surface and the visual axis; but, as stated, it does not exist. In our work use was made of a specially constructed instrument[1] embodying a head support, a telescope, and an arc graduated from zero at its center toward either end. The optic axis of the telescope always intersects the center of generation of the arc as the telescope is moved along the arc. The telescope and arc are rigidly connected so that they move together when adjusted horizontally or toward or from the patient's eye. At the anterior end of the telescope and just posterior to the telescope objective is a heavy black circle centered on the optic axis of the telescope and at its posterior end is an illuminated wheel-shaped target with bright rim, spokes, and hub, also centered on the optic axis. At the telescope eyepiece is a scale consisting of a horizontal and a vertical line which intersects at the optic axis. The patient's head being fixed in the head support, the telescope is located at zero on the arc and is adjusted horizontally and vertically until the patient sees the target centered within the black circle. As the target just fits within the black circle and as each is centered on the optic axis it is seen that the optic axis of the telescope now coincides with the visual axis and that angular measurement of the visual axis during a movement of the eye is indicated by the angle to which the telescope has moved from zero on the arc, the patient steadily fixating the center of the target. A second target consisting of a small red spot is adjusted horizontally and vertically just before the telescope until the patient sees the red spot centered on the hub of the target. The red spot also is now centered on the visual axis. This red spot is fixed in relation to the patient's head and does not move with the telescope as does the wheel-shaped target.

When the instrument is adjusted as described we term it to be in the primary position.

A short digression into geometric optics will assist in making clear that which follows. The theory of image formation comprises a positive lens centered on its optic axis. This centration is accomplished by locating the center of curvature of each surface of the lens on its optic axis. A ray of light passing along the optic axis will meet each lens surface perpendicularly and will pass undeviated through the lens as a straight line along the optic axis. Conversely, such partial reflection as occurs

at each lens surface is undeviated, but is reflected back along the optic axis; that is, the light ray passing along the optic axis and reflected at either lens surface returns along its original path, a straight line. Light rays from a myriad of points comprising the form and detail of an object are converged by the lens to form corresponding image points which form the shape and detail of the image as a replica of the object. If, now, we consider this lens to be the crystalline lens and locate just before it a convexo-plane lens with its plane surface toward the lens and perpendicular to its optic axis and with the center of curvature of the convex surface also located on the optic axis, we may consider this convex surface to be the cornea of a schematic eye in which both cornea and crystalline lens are centered on the same axis. Assuming this axis to be the visual axis, it is seen from the above that an axial ray will pass through both lenses in a straight line and we have a "straight-line visual axis," which has been postulated from time immemorial. That this is not the case is the consensus of opinion of all investigators who find the cornea to have an axis of its own (the optic axis), which seldom coincides with the visual axis. Therefore, the cornea, at the visual axis, is not perpendicular thereto by reason of the angle between the corneal and visual axes. This angle we term the Physiological Angle, which is the subject of the present discussion.

In a previous research by R. S. Park and G. E. Park,[2] the visual axis was found to pass always through a point 13.8 mm. posterior to the cornea of an emmetropic eye when the gaze is directly forward. An advancement of the eye occurs in a nasalward excursion and recession in a templeward excursion, with the visual axis constantly passing through this point. This point is fixed in relation to the head but not in relation to the eye and is the "logical" center about which angular measurement should be made and not the so-called center of motion.

The instrument* was constructed to locate the center of generation of the arc at this point and for this reason. It was accomplished by constructing the telescope objective with a posterior focus which falls at the target as well as at the eyepiece scale, each equidistant from the objective, and with an anterior focus which falls 7 to 8 millimeters posterior to the cornea. The center of generation of the arc is positioned 6 millimeters posterior to this focus within the eye when the focus lies 7.8 mm. posterior to the cornea. In the conditions here employed, 7.8 mm. is taken as the average radius of the cornea in emmetropia; 7.8 mm. plus 6 mm. equal 13.8 mm. posterior to the cornea, which point may be called the visual center of the eye.

The arc center is located in relation to the center of corneal curvature and not in relation to the cornea and is correctly located for corneal radii of less or more than 7.8 mm. by employing the method next described.

In conducting an examination, the patient's head is fixed in the head support and the instrument adjusted to the primary position as described. The telescope, rigidly connected to the arc, is next adjusted toward or from the eye until the image of the target, reflected at the cornea, is clearly focused at the eyepiece scale where it is viewed by the observer. The anterior focus of the objective is thus located to intersect the center of corneal curvature, irrespective of what the radius of curvature of the cornea may be. When the target image is focused at the eyepiece scale, light from the target passing through the objective is converged by the objective to focus at the corneal center of curvature but, meeting the cornea, certain rays fall perpendicularly upon the cornea and are reflected directly back to the objective which converges them to focus at the eyepiece scale the same distance from the objective as is the target. Other rays, reflected at slight angles, make up the physical dimensions and luminosity of the image. If the corneal center of curvature be on the visual

* The instrument was designed and constructed by Mr. Clile C. Allen to whom I wish to pay my debt of gratitude for his untiring service and interest in this work.

axis, the target image would be seen centered on the eyepiece scale. This, however, is seldom the case. The image is usually seen to lie below and at one side of the center of the eyepiece scale and at varying distances from the center in the same subject. The angle between the corneal and visual axes, the physiological angle, is found by directing the patient to fixate the center of the red spot and moving the telescope along the arc until the target image is seen centered on the vertical line of the eyepiece scale. The angle now indicated on the arc is the physiological angle.

We find it à propos to discuss the generally accepted beliefs regarding the shape of the anterior surface of the cornea. It was formerly represented as ellipsoidal but, according to the results of numerous investigators, especially Gullstrand and Blix, it can, in general, be assumed to be of spherical shape for the portion utilized over a pupil of normal size. According to Gullstrand, that portion of the cornea which can be considered as spherical extends about four millimeters horizontally and slightly less vertically. It is decentered outward and slightly downward in most cases. As a matter of interest, the results would be the same whether the cornea were considered as spherical or ellipsoidal.

In order to avoid confusion and to orientate ourselves with reference to the other angles which are so often mentioned in this connection, we must digress for a short time.

The principal purpose of a language is to express thought so that it may be readily understood by others. Unfortunately, this purpose has been neglected in the field of physiological optics in discussing the angle made by the optic and visual axes. No doubt, angle alpha, beta, gamma, and angle kappa of Landoldt convey a definite meaning to the reader. However, I doubt whether he would be able to differentiate between them with exactness and yet be in accord with his colleagues. I can assure him that even if he scans the literature and looks for help he would still be as muddled afterwards as before. As has been very aptly expressed in the American Encyclopedia and Dictionary of Ophthalmology, these terms are used "according to the individual author's definition."

Generally the angle alpha is defined as being the angle formed by the junction of the visual axis and the optic axis. Other authors classify the angle between the optic axis and the visual axis as angle beta.

Some authors use angle gamma merely as another name for the angle alpha or beta while others use it as the angle formed between the line of fixation (that is, a line from the object observed to the center of rotation of the eye, which has been proved as nonexistent) and the optic axis. Other authorities use it as the angle formed between the visual axis and the center of the pupil.

Angle kappa is described as the angle between the line of fixation and the line normal to the cornea that passes through the pupillary center.

As to their practical usefulness, the angle between the visual axis and the center of the pupil is of far greater importance in strabismus. In most cases, the visual axis lies to the nasal side of the pupil. Thus, when the visual lines are parallel a large angle may give rise to a deceptive appearance of divergent squint. Similarly, when the visual axis lies on the opposite side of the pupil under the same conditions one may mistake it for convergent strabismus.

It appears to the writer that there should be some means by which a standardized nomenclature could be established for these angles, thereby avoiding such confusion in future publications.

The term "physiological angle," here used, corresponds to the angle alpha as used by most authors; that is, between the visual axis (visierlinie) and the optic axis.

Unfortunately, most of the investigators of ocular movements have made use of an extrinsic light reflected from the cornea and by observing the reflection have computed their findings.

The data given are made up of apparent causes and effects with no thought of claiming an exact pattern of the movement, but instead, the ex-

tremes (limits) of such changes in position, in the eye during fixation, as have been observed, will be considered. It is believed, however, that the angular measurements are exact.

While a definite physical explanation of this phenomenon cannot be given, the facts observed are here reported, with what seems the most likely theory to explain them.

History

Hess[3] made a thorough investigation of the movements of the lens during accommodation and found that there is considerable movement of the lens downward, as described by Tscherning. Hess claimed that the lens sinks downward by gravity, about .25 to .36 millimeters but that the direction in relation to the pupil is dependent upon the position of the head, and that the movement does not occur when the iris is horizontal. He observed also, in an eye which had been eserinized, a maximum movement of one millimeter when the head moved through an angle of 180 degrees from shoulder to shoulder.

Hess further observed a marked shaking of the lens in an eserinized eye, with every movement of the head, the phenomenon disappearing after the instillation of atropine. This movement was most marked when the head was held backwards. The lens seemed to make three or four oscillations after cessation of the head movement from side to side.

In determining the movement of the lens a point of light was used which had a constant position relative to the eye; during strong accommodation there was an apparent rise of the point of light, showing a downward movement of the fovea centralis.

Hess and several other observers[4] noted irregularities of the border of the lens such as might be due to greater pressure on one part than on others. Hess observed that this wavy border became quite uniform after the instillation of eserine.

Hess also observed a certain phenomenon which he believed was probably due to the fact that the iris and ciliary musculature did not function simulateously. In substantiation he cited certain observations.

Peckham[5] questioned our right to assume that objects are fused by mechanism of neural anatomy rather than perception after he made certain observations which he used to locate images in relation to the fovea according to the present knowledge of foveal projection.

In order to make these observations he had constructed a large and very accurate stereoscope with the mirrors so arranged that the subject sees a large black field with the right eye and another similar field with the left eye. Use was made of two telescopes placed behind the large fields of the stereoscope so that they were focused on the subject's eye. By this arrangement, the movement of the eyes could be observed and recorded on a circular scale.

Identical pictures, to be fused by the subject, were placed in each half of the stereoscope. By placing prisms in the base-out or base-in positions Peckham was able to carry the subject almost to diplopia while the latter still reported fusion or oneness. The eyes of the subject, in overcoming a 10-degree prism, moved through angles often less than half this amount, although occasionally they moved even too far to bring the foveae beneath the images. Hence, Peckham concluded that the fovea was 3 to 4 degrees from the ideal position. He observed, moreover, that when certain subjects were required to look successively without mirrors at two points on a large perpendicular field at a distance of half a meter, although each point was placed equally distant from a mid-line (which should have required the same amount of convergence) there was as much as 4 or 5 degrees of difference between these two fixations.

Clark[6] has constructed a Wheatstone stereoscope which was mounted on a camera so that the ocular movements could be photographed while the eyes were observing the stereograms.

The photographs were made while the subjects alternately fixated two specific points in a complex stereoscopic picture. These points were selected so as to require a maximum of convergence and divergence during the

change. In order to determine the influence of context on the eye movements, the identical points were reproduced on white cardboard.

He concluded, as Verhoeff had previously done, that stereoptic perception is to be explained fundamentally as the result of the cerebral organization and unification of a series of intermittent retinal impressions which occur as clear vision changes from one eye to the other. He interpreted certain observations that he made thus: that the eyes moved at random sufficiently fast to cause a definite diminution of vision; that convergence had no effect on fixation; that any position within an area of 1 degree to 1.5 degrees from the center of the fovea may be used to "fixate" a point. The randomness and irregularity is a characteristic rather than an exception. Wide individual differences in behavior of the eyes are found in successive performances.

Experiments

Only those subjects were used who were able to concentrate sufficiently well to maintain fixation upon the center of the target or supplementary red spot, and it was insisted that they do this at all times during the measurements. In age they ranged from 12 to 70 years.

As mentioned above, the image of the target was rarely found to be reflected directly back along its path but instead was usually observed below the horizontal line and to one or the other side of the vertical line of the eyepiece scale. Means were provided in the construction of the instrument for the exact measurements of the angle of reflection from the vertical line. The instrument had been constructed with the idea that there would be no shift of this angle and it was hoped to make an exact measurement of the angle between the visual axis and the optic axis, which had been presupposed to be fixed; but this the observations have shown is not the case.

It was noticed that this "reflex" changed its relationship to the lines of the eyepiece scale while the subject was fixating the center of the target during the time observations were being made through the instrument. But with some subjects this angle would remain fixed over a period of several minutes or until they changed their point of regard momentarily, when a change would be noticed. In others the angle remained stationary for only a few minutes, when it would either begin to diminish or increase to a certain limit where it became fixed for a short period, then reversed and continued to the original position and even beyond. It could at any time become momentarily fixed at any position within the limits of this excursion. In other subjects there was almost a continuous randomness present with only a short pause made at different positions in the excursion. Some subjects showed a much greater limit of variation than others but the extremes would reach as much as twice or more the initial reading. There are no norms, not even for the same individual.

The following drugs were used in our endeavors to establish a control of this phenomenon; eserine, homatropine, and atropine. Observations were made immediately after the instillation of eserine and homatropine, and were continued for an indefinite length of time, even to two or three hours. Atropine was used several days before observations were made.

Invariably, immediately after the instillation of eserine the angle became much smaller, where it would remain for a short time and then increase beyond the original amount. After three or four instillations of 0.25 percent eserine, it was noticed that the reflex moving at random, would gradually approach the horizontal line, even rising above it, but at once would drop below again. Eventually with marked randomness (and sometimes requiring an hour or so) the reflex would appear at the intersection of the horizontal and vertical lines. At that time the angle had become zero, varying perhaps from plus 1 degree or 2 degrees to minus 1 degree or 2 degrees where it would remain. Under that condition, the image of the target was being reflected back along the visual axis, which at that time was

corresponding to the optic axis of the eye and the optic axis of the instrument.

With homatropine, a different condition developed. Immediately after its instillation the angle would undergo a change; sometimes it would increase and at other times diminish. The general randomness was similar to that noticed with eserine, and in a majority of cases, the angle would eventually approach zero. There were many exceptions to this, for in many cases the final results might be that the angle had increased from 6 or 8 degrees to 17 degrees, where it would remain more or less fixed. Apparently, the angle did not change from one position to another so readily after the homatropine had become fully effective, especially if the eye were held in fixation. But if there were a change in the point of regard and the target were fixed again, at times a definite oscillation of the reflex was observed, resulting eventually in a different angle between the optic and visual axes.

A condition very similar to that developed with homatropine was observed with atropine. A more complete study of atropine is being made at the present time.

In measuring aphakic patients, another important observation was made. Some difficulties were experienced in establishing coincidence of the visual axis and optic axis of the instrument on account of low visual acuity, but by allowing the subject to select the position which appeared to be the clearest, the physiological angle would become zero without exception, provided postoperative refraction had secured practically normal vision.

Another check that was used was to move the instrument until the physiological angle was brought to zero, at which time the subject would invariably report the most acute vision of the target within the circle; the zero position being reached without the knowledge of the subject excepting as the position of the most acute vision.

This corresponds very closely, if not identically, with the condition which was caused by eserine in establishing coincidence of the optic and visual axes of the eye with the optic axis of the instrument during fixation.

Thus far, the observations have been objective in nature, but there are certain subjective findings which have been verified and which corroborated the objective.

The author has on various occasions, acting as a subject, observed that at times the eye seemed to be making certain movements beyond his control and against his will.

This same phenomenon has been introspectively experienced and reported by another observer* who served as a subject on several occasions.

At the first examination with him as subject, consecutive readings showed a steady fixation. At that time he did not observe any unusual introspective phenomena. When, however, at a subsequent examination he was in a state of fatigue due to a considerable loss of sleep and to having been under prolonged nervous strain, he noticed introspectively that his fixation was very unsteady. At certain times the image of the target became blurred and at such times he declared he could recognize a definite pull occurring within his eye. He also declared that at this time he recognized the fact that the eye itself was making definite involuntary movements (reflex movements) but at the end of these reflex movements, the image became clear again.

He subjectively was able to identify and to report the exact time of the reflex action by the manifestation of a large excursion during which time the author was able to verify the same objectively. Conversely, the author could independently observe this reflex, and report it to the subject who would substantiate subjectively its manifestation.

Theory

As optical physicists, we like to believe that in binocular foveal fixations there is a constant geometric setup, such as is shown in diagrams with which we are familiar—that is to say,

* Dr. A. C. Ivy, Professor of Physiology, Northwestern University, is the observer mentioned.

two symmetrical lines of incidence from the object point, through the corneae and the nodal points, to the foveae. Physiologically it is unthinkable. Constancy of physiological functions pertains to results, not to detailed mechanism.

In a man-made device the fixed relation of its parts insures identical results at all times. Many devices may be constructed, each embodying a different relation of its parts, all of which obtain identical results.

A natural creation differs therefrom; it cannot utilize such fixed construction but must function by adaptation of such means as are best suited. A subject may fixate a point but, as fixation is prolonged, the means appear to change their relation and this change is evident in varying amounts in observations made at intervals during prolonged fixation. Nature aims only at success and this is attained by adaptation of the most suitable means at any particular moment.

So, in binocular foveal fixation, it can, we think, be assumed that the resultant remains constant; that is, that the two foveae are kept steady under the central images. But it would be unreasonable, knowing what we know about neuromuscular function, to suppose that the flow of muscle effort, the muscular pattern, maintains the same line of direction and the same relative quantities at all times in an absolute sense.

If nothing else occurs, it is almost certain that innervation and contraction, both in the ciliary muscles and in the extrinsic muscles, shift from one group of muscle fibers to another, as they do in all muscles under continued effort. But it is very likely that the changes are of a grosser character than that. Almost certainly the entire musculature shifts its line of force, so that the extrinsic muscles change the angle of fixation and the ciliary muscles change the shape and curvature of the crystalline lenses, but with an uncanny coördination which maintains the same resultant; namely, the focusing of the central images on the two foveae.

Possibly the extrinsic muscles rotate the eye to approximately the point of fixation and the ciliary muscle acts as what might be termed a fine adjustment for exact fixation by means of this change in the shape of the lens. In prolonged fixation it is quite possible that, due to innervation and contraction, the extrinsic muscles act to shift the fovea away from the image and that the ciliary muscle acts to shift the image to the new foveal position.

Conversely, it is also possible that the ciliary muscle, for the same reason, shifts the image and that the extrinsic muscles rotate the eye to bring the fovea beneath this new image position.

The theory of fixation by the extrinsic muscles only appears to be modified in this respect. Inversely, in an aphakic eye the ciliary muscle cannot exert this influence and fixation is entirely accomplished by the extrinsic muscles.

This being the case, the line of incidence would not always be two straight lines from the object-point, through the corneae and nodal points, to the foveae. They would sometimes pierce the corneae eccentrically, and be bent by a prismlike effect of the nonuniform shape and curvature of the lenses. This is apparently what takes place under our observations.

The question as to which muscles originate the shift, the ciliary or the extrinsic muscles, and which compensate is hard to answer, as we have mentioned before, for they are probably interchangeable.

The whole matter is undoubtedly one of adaptation and fatigue, plus an uncanny coördination to maintain a desired resultant. Varying conditions would seem to vary the rôle of originator and compensator between these muscles.

Conclusions

1. The described method of securing coincidence of the optic axis of the telescope with the visual axis is accurate to within a maximum error of one-fourth degree.

2. The amount of error in identifying the visual axis by means of the red spot is of the same order as given above.

3. The angular relation of the optic and visual axes is a variable which accounts for different readings over a series of observations or consecutive readings within a short period.

4. These variable readings can scarcely be attributed to any corneal change nor to a change in the anatomical position of the fovea.

5. This leaves but one factor within the eye to account for such variation, the crystalline lens. Possible unequal action of the ciliary muscle, causing prismatic action of the lens by excessive compression at a portion of the lens margin or bodily decentration of the lens from the then existing visual axis, would account for such variation.

6. The described effect of eserine is entirely upon the ciliary muscle, which seems to indicate this variation to be a result of unequal action of the ciliary muscle.

7. There appears to be a definite coordination between the ciliary and extrinsic muscles in establishing and maintaining fixation.

I wish to take this opportunity to thank Drs. Sanford R. Gifford, A. C. Ivy, and A. J. Carlson, to whom I am specifically indebted for having given freely their opinions and observations.

9140 Exchange Avenue.

Bibliography

[1] Park, G. E. Arch. of Ophth., 1936, v. 15, April.
[2] Park, R. S., and G. E. Amer. Jour. Physiol., 1933, v. 104, June 1, no. 3, pp. 545-552.
[3] Hess, C. v. Handbuch der normalen und pathologischen Physiologie, 1929, v. 12, p. 145.
———. Arch f. Ophth., 1896, v. 42, p. 288.
———. Arch. f. Ophth., 1897, v. 43, p. 477.
[4] Schaeffer. Textbook of physiology. 1896, p. 1034.
[5] Peckham, R. H. Arch. of Ophth., 1934, v. 12, Oct., pp. 562-566.
[6] Clark, B. C. Amer. Jour. Psychol., 1936, v. 48, Jan., pp. 82-97.

Discussion. DR. CONRAD BERENS: Have you made studies in any cases with fixed abnormal retinal correspondence?

DR. PARK: We have not used any cases except what we thought were normal fixations, because we tried to work this out from a physiological standpoint.

DR. W. B. LANCASTER: What movements do you attribute to the crystalline lens that are not explainable by the movement of the eyeballs?

DR. PARK: During our examination the visual axis remains coincident with the optic axis of the telescope (that is, from the target observed to the front of the eye). Any shift in the eyeball would move the fovea from under the image where it was primarily.

From the fact that we observe a change in this reflection and still can tell within a quarter of a degree the position of the visual axis, we would assume that the front of the eye was moving and the fovea moved at the same time and still the image would fall on the fovea. If there was not a compensatory movement within the eye, we could not recognize within such a small degree when central fixation had been established.

DR. LANCASTER: Is it your conception that the fixation point mathematically or geometrically in the fovea is immovable or does it shift around to different parts of the fovea?

DR. PARK: If, as has been assumed, the fovea is only about two tenths of a millimeter in diameter, it probably wouldn't make very much difference.

DR. LANCASTER: Does that explain the little shift you get?

DR. PARK: Well, our shift is not only a little shift. Sometimes these angles increase from zero to 17 degrees or greater.

DR. ALFRED COWAN: Does not the angle change with the dioptric power of the eye?

DR. PARK: It might do so, because in accommodation others have observed that the relation of the pupil with the axes varies, but with our instrument, measurements are made with the fixation at infinity. The target is located at infinity. So, unless the patient was unconsciously accommodating there

would be no change in that relationship.

DR. COWAN: Would not that explain the difference during the use of eserine, atropine, and homatropine?

DR. PARK: I do not believe so, because this change goes on just the same in a normally functioning eye without the use of drugs.

DR. G. GUIBOR: Is the variation due to a change in the corneal apex? Does the variation occur in aphakic eyes?

DR. PARK: There is, no doubt, a slight variation in the curvature of the cornea, for it, being an elastic tissue, is not rigidly fixed. Other authors in their work found only a slight variation in the curvature of the cornea during accommodation. This slight variation in the corneal curvature would not account for our observation.

In answer to the second question, there is no reason to suspect that the corneal curvature of an aphakic eye would change very differently from that in a normal eye.

DR. T. J. WILLIAMS: Does the essayist believe the lens power changes from an upright to a horizontal position? Is the lens not constant in value?

DR. PARK: I should not think the position would make any difference as to the value or the function of the lens.

OBSERVATIONS ON THE REDUCING SUBSTANCES (GLUCOSE) OF THE AQUEOUS AND VITREOUS HUMORS OF THE EYE

WILLIAM M. JAMES, M.D. AND A. J. SIEFKER, PH.D.
SAINT LOUIS

In the fasting rabbit under dial anesthesia the glucose values were: aqueous 164 mg. percent, vitreous 104 mg. percent, venous blood 137 mg. percent, arterial blood 158 mg. percent. The aqueous glucose followed closely fluctuations in the blood glucose. The vitreous glucose did not follow so closely the rise and fall of the blood glucose. Operative procedures used to relieve intraocular hypertension produced no significant alterations in the glucose values of the aqueous or vitreous. Adrenaline, eserine, or atropine applied locally to the eye produced material changes in the rate of diffusion of glucose between the blood, aqueous, and vitreous. Changes in the intraocular pressure were recorded with alterations of the blood glucose. In the normal eye no significant changes in intraocular pressure were noted following the local application of atropine, eserine, or acetylcholine. Various types of mechanical irritation of the uveal bed were followed by prompt increases in intraocular pressure. From the Department of Ophthalmology, Washington University School of Medicine. Read before the Association for Research in Ophthalmology at Kansas City, Missouri, May 12, 1936.

The presence of sugar in the aqueous humor of the eye was recognized by Claude Bernard in 1859, and has been verified many times by subsequent observers in a wide variety of experimental animals. It is only during the last 25 years that simultaneous comparative values have been obtained for the ocular fluids and the blood. Ask[1] found the aqueous sugar 0.01-0.02 percent greater than blood; Dieter[2] found the aqueous glucose 0.004 percent greater. Duke-Elder[3] found the average values for the rabbit to be aqueous 0.151 gm. per 100 c.c.; arterial plasma 0.148 gm. per 100 c.c.; venous plasma 0.125 gm. per 100 c.c. After applying a correction factor to obtain values equivalent per 100 c.c. of water, the results were: aqueous 0.151 gm. per 100 c.c.; arterial plasma 0.158 gm. per 100 c.c.; venous plasma 0.133 gm. per 100 c.c. Duke-Elder concluded that "the sugar content of the aqueous humor lies between that of arterial and venous blood." Adler,[4] working with cats, obtained the following average for nine cats: blood 135 mg. percent; aqueous 113 mg. percent; vitreous 64 mg. percent. Adler has also shown that following quantitative changes in the blood sugar similar changes occur in the humors of the eye. Walker,[5] working with fowls, rabbits, cats, and dogs, found that the reducing substance of the aqueous was in 14 experiments 85 percent of that of the plasma. See table 1.

Experimental

The normal glucose values of the aqueous, vitreous, and blood of rabbits. Because carbohydrate is the chief

source of body energy and disorders of carbohydrate metabolism are frequently accompanied by ocular changes, and because daily quantitative changes occur in the blood sugar following food intake, emotional stress, and fatigue, it was felt that there might possibly be some connection between the rise and fall of the sugar of the blood, aqueous, and vitreous and the maintenance of intraocular pressure.

The normal glucose values for the blood, aqueous, and vitreous of healthy fasting rabbits under dial-Ciba anesthesia were determined. Single samples of aqueous and vitreous were analyzed. The rabbits were not fed for 18 hours preceding the experiments. Anesthesia was induced with dial injected slowly into the marginal ear vein. This was done to avoid the wide fluctuations in the blood sugar which occur with excitement. Twenty minutes after anesthesia was induced, a sample of blood was withdrawn from the marginal ear vein. At the same time, 0.2-0.27 c.c. of aqueous was aspirated with a sharp 26-gauge needle. A vitreous specimen was obtained by plunging a 22-gauge needle into the vitreous and aspirating 0.3 c.c.

The glucose determinations were made by the Hagedorn-Jensen method as described by F. H. Adler.[4] The values obtained by this method were 23.1 mg. percent higher than the "true sugar" values obtained by the Shaffer-Hartmann method. The findings reported are those determined by the Hagedorn-Jensen method. The average venous blood sugar was 137 mg. percent, the average aqueous sugar was 164 mg. percent, and the average vitreous sugar was 104 mg. percent. Blood from the central artery of the ear averaged 21 mg. percent above that of blood from the marginal ear vein. See table 2.

Table 1

THE GLUCOSE VALUES OF THE AQUEOUS, VITREOUS, AND BLOOD

Author	Aqueous	Vitreous	Blood		Animal
Ask	0.01–0.02% > blood				Man
Dieter	0.004% > blood				Man
Duke-Elder	mg. percent 151		Arterial plasma 148 mg.%	Venous plasma 125 mg.%	Rabbit
Adler	113	64 mg.%	135 mg.%		Cat
Walker	98 148 101 165 170		Plasma mg. percent 118 142 145 163 164		Rabbit
James and Siefker	164	104 mg.%	Arterial 151 mg.%	Venous 137 mg.%	Rabbit

Rate of equilibration of the aqueous, vitreous, and blood. The rate of change following the administration of glucose intravenously was recorded for a series of 15 rabbits after the normal fasting blood-sugar values had been determined. Healthy fasting rabbits under dial anesthesia weighing 2000 to 2400 gm. were used. A specimen of blood was withdrawn from the marginal ear vein; aqueous 0.2 c.c. and vitreous 0.3 c.c. were aspirated as control samples from the left eye. Then 5 c.c. of 10-percent glucose solution was injected slowly into the marginal ear vein. After stated periods of time, a second blood speci-

Table 2

GLUCOSE VALUES OF THE AQUEOUS, VITREOUS, AND BLOOD OF THE FASTING RABBIT

No.	Blood venous	Aqueous		Vitreous	
		Right	Left	Right	Left
	mg. percent	mg. percent	mg. percent	mg. percent	mg. percent
1	107	99		103	104
2	128	142	137	97	98
3	144	227	219	130	
4	138	146	144	123	118
5	145	208	203	103	102
6	137	171	165	131	121
7	160	180	168	103	100
8	144	162	150	87	88
9	139	147	164	92	92
10	127	138	153	88	88

Average Venous Blood 137 mg.%
Average Aqueous 164 mg.%
Average Vitreous 104 mg.%

men was obtained and a single specimen each of aqueous and vitreous was obtained from the right eye.

Figure 1 shows the rate of rise and fall of the glucose values of the blood, aqueous, and vitreous after the administration of a known amount of glucose, intravenously. The rise and fall of the blood and aqueous glucose are almost parallel, but there is a great lag in the rate of equilibration in the vitreous. The rapid fluctuation of the aqueous and blood sugar with the slow changes in vitreous are probably accompanied by volumetric fluid changes in the eye which influence the intraocular pressure.

The effect of various operative procedures. The influence of iridectomies, iris inclusions, and corneoscleral trephinings on the glucose of the aqueous and vitreous was investigated. Table 3 shows the values obtained in the fasting state. A three-weeks' period of time was allowed to elapse following the operative procedure before the determinations were made. The left eye in each animal served as a control. After iridectomy of the right eye in six animals, the following average glucose values were obtained:

Blood glucose ...127 mg. percent
Right aqueous ...150 mg. percent
Left aqueous ....148 mg. percent
Right vitreous ... 83 mg. percent
Left vitreous .... 84 mg. percent

In two animals following iris inclusion the values were:

Blood glucose ...105 mg. percent
Right aqueous ...123 mg. percent
Left aqueous ....118 mg. percent

Table 3

THE INFLUENCE OF OPERATIVE PROCEDURES

Rabbits	Blood	Aqueous		Vitreous		Procedure
		Right	Left	Right	Left	
	mg. percent	mg. percent	mg. percent	mg. percent	mg. percent	
Average of 6 animals	127	150	148	83	84	Iridectomy right eye
Average of 2 animals	106	123	118	49	48	Iris inclusion right eye
Average of 2 animals	129	144	143	80	81	Corneoscleral trephining right eye

Operative procedures performed on the right eye three weeks before the determinations were made.

Right vitreous ... 48 mg. percent
Left vitreous .... 47 mg. percent

In two animals after corneoscleral trephinings with peripheral iridectomies, the following values were obtained:

Blood glucose ...129 mg. percent
Right aqueous ...143 mg. percent
Left aqueous ....143 mg. percent
Right vitreous ... 79 mg. percent
Left vitreous .... 80 mg. percent

The rate of glucose diffusion into the aqueous chamber was compared in three rabbits which had had a broad basal iridectomy of the right eye. The fasting animals under dial anesthesia were given 5 c.c. of a 10-percent glucose solution, intravenously, and after 30 minutes the glucose values of the right and left aqueous humors were determined. The aqueous of the iridectomized eyes averaged 207 mg. percent, of the normal eyes 216 mg. percent.

The findings indicate that the operative procedures selected did not alter the carbohydrate balance of the aque-

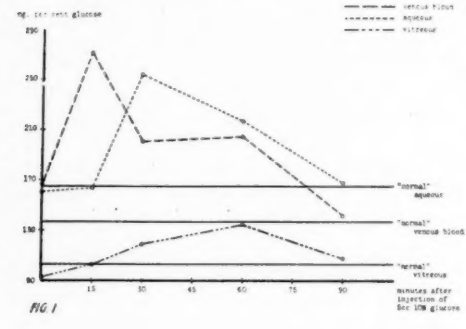


FIG. 1

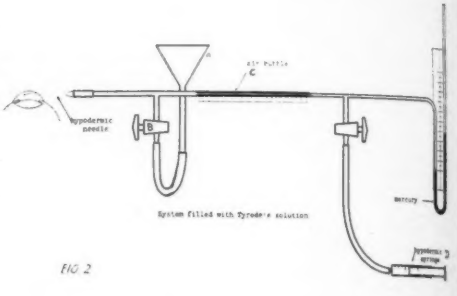


FIG. 2

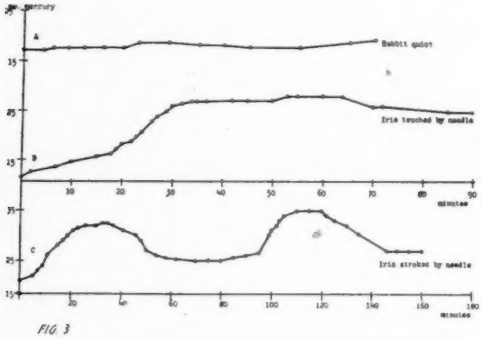


FIG. 3

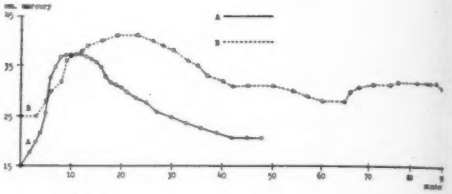


FIG. 4

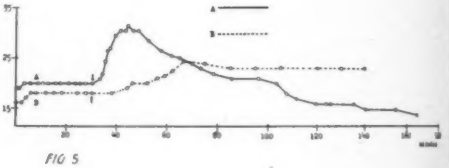


FIG. 5

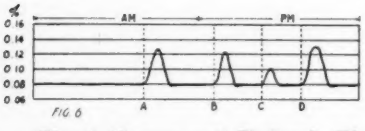


FIG. 6

Fig. 1 (James and Siefker). The rate of equilibration of the aqueous, vitreous, and blood glucose.

Fig. 2 (James and Siefker). Capillary mercury manometer.

Fig. 3 (James and Siefker). Intraocular-pressure changes following iris irritation.

Fig. 4 (James and Siefker). Intraocular-pressure changes (Schiötz) following: A, hemorrhage into anterior chamber; B, pressure raised to 50 mm. and then lowered to 25 mm.

Fig. 5 (James and Siefker). Intraocular-pressure changes (Schiötz) following: A, 5 c.c. of 10-percent glucose injected intravenously; B, 1 c.c. of 1:100,000 adrenalin injected intravenously.

Fig. 6 (James and Siefker). Typical twenty-four hours' blood-glucose chart. A, breakfast; B, lunch; C, tea; D, dinner. From Cameron's Textbook of biochemistry,[6] by permission of The Macmillan Company, publishers.

Table 4

EFFECT OF ADRENALIN CHLORIDE

Rabbit Number	Procedure	Blood Glucose		Aqueous Right before Adrenalin	Aqueous Left After Adrenalin
		Before	Thirty Minutes Later		
		mg. percent	mg. percent	mg. percent	mg. percent
1.	Received adrenalin chloride 1:1000 0.2 c.c., subcutaneously	123	203	157	157
2.	Received 1 c.c. of a 1:100,000 solution, intravenously	150	228	156	175
3.	Received 1 c.c. of a 1:100,000 solution, intravenously	154	194	164	156
4.	Received 1 c.c. of a 1:100,000 solution, intravenously	120	145	147	132
5.	Received 1 c.c. of a 1:100,000 solution, intravenously	108	127	124	132
6.	Received 1 c.c. of a 1:100,000 solution, intravenously	131	150	148	156
7.	Adrenalin-soaked pledget of cotton applied under upper lid of right eye for ten minutes	116	132	136	157
8.		148	173	162	170
	Average	131	169	148	154

ous, vitreous, and blood in the fasting state and that the loss of iris substance in the iridectomized animals did not appreciably affect the diffusion of glucose into the aqueous.

The effect of adrenalin chloride. Because adrenalin is closely associated with the carbohydrate metabolism and adrenalin hyperglycemia is a well-recognized reaction following fear or anger, and because adrenalin is used in the treatment of glaucoma, the following experiments were performed: Adrenalin chloride was given as shown in table 4 to fasting rabbits resting quietly under dial anesthesia. Adrenalin produced a definite hyperglycemia with a rise in the aqueous glucose. This rise of the aqueous glucose was not proportionally so high as that which followed hyperglycemia without the localized vasoconstrictive effect of adrenalin, as

Table 5

EFFECT OF ESERINE AND ATROPINE

Rabbits	Blood Glucose	Aqueous		Comment
Average of 3 animals	163 mg. %	Right eserinized 171 mg. %	Left normal 171 mg. %	Fasting animals. Right eye under eserine
Average of 4 animals	116 mg. %	Right eye eserinized		Aqueous determinations 30 min. after glucose injection
	Glucose—5 c.c. of 5% sol., intravenously. 30 min. later 210 mg. %	204 mg. %	170 mg. %	
Average of 3 animals	209 mg. %	Right eye atropinized	Left normal	Aqueous determinations 30 min. after glucose injection
	Glucose—5 c.c. of 5% sol., intravenously. 30 min. later 350+mg. %	133 mg. %	202 mg. %	

was noted when the adrenalin was applied directly to the eye.

The effect of eserine. Eserine salicylate, 0.2 percent aqueous solution, was instilled into the right eyes of rabbits three times daily for three days preceding the experiments. The values obtained in fasting rabbits are shown in table 5. Eserine in the fasting rabbit did not influence the glucose equilibrium of the two eyes. In another group of rabbits eserine salicylate, 0.2 percent aqueous solution was instilled into the right eyes three times daily for three days preceding the experiments. The blood-sugar values were obtained; then glucose, 5 c.c. of a 5-percent solution, was injected into the marginal ear vein. Thirty minutes later the blood and aqueous glucose values were determined. See table 5. The eserinized eyes equilibrated more rapidly with fluctuations in the blood-stream glucose than did the normal untreated eyes.

The effect of atropine sulphate. Atropine sulphate, 1 percent, was instilled into the right eyes of rabbits three times daily for three days before the glucose values were determined. Then glucose, 5 c.c. of a 5-percent solution, was given intravenously. See table 5. Atropine produced a general hyperglycemia in the fasting rabbit. Following the injection of glucose, intravenously, the blood glucose rose very high (out of range of the reagents being used) and there was a marked difference in the glucose values of the aqueous of the two eyes. The atropinized eyes equilibrated with the blood much less rapidly than the normal eyes.

Intraocular-pressure determinations. The intraocular pressure of normal fasting rabbits under dial-Ciba anesthesia was determined. For this purpose a capillary mercury manometer was used (see figure 2). The intraocular tension was determined by the Schiötz tonometer. The pressure in the manometer system was elevated to the level indicated by the tonometer by varying the height of the reservoir of Tyrode's solution, which was connected in funnel A. A small cut was made through the anterior two thirds of the cornea with a Graefe knife. Then with fluid running through the needle at the known pressure the needle was inserted into the anterior chamber on the plane shown. Stopcock B was then closed and a small bubble, C, brought back to the initial point in the system by altering the volume of fluid in the system by manipulating the syringe, D. After some practice it was possible to carry out the pressure determinations without losing aqueous or inducing any change in the size of the pupil. We found that if the iris was touched or aqueous lost, wide pressure variations were obtained. Figure 3, A, shows the type of pressure readings that were obtained when the rabbit was resting quietly under anesthesia. Figure 3, B and C, indicated a rise in intraocular pressure after the iris was lightly stroked with the tip of the needle in the anterior chamber. Figure 4, A, was obtained after the aqueous had been allowed to escape and the pressure then brought back to the initial level. There was a slight escape of blood into the anterior chamber and with this there was a marked rise in the intraocular pressure. Figure 4, B, was obtained after the pressure in the eye had been elevated to 50 mm. of mercury for two minutes after insertion of the needle and then lowered to 25 mm. Again there was a marked rise in intraocular pressure. Figure 5, A, demonstrates the effect of glucose, 5 c.c. of a 10-percent solution, given intravenously. There was a rather marked rise of pressure followed by a slow decline to a subnormal level. Figure 5, B, shows the effect of adrenalin, .1 c.c. of a 1:100,000 solution, injected slowly intravenously.

Discussion

The daily normal variations in man of the blood-glucose level are well shown in a chart taken from Cameron's text-book of Biochemistry (fig. 6). By altering the blood-glucose values in rabbits by giving glucose intravenously or by producing an adrenalin hyperglycemia, it is possible to alter the glucose values of the aqueous and vitreous. With the increase in osmotic pressure

of the aqueous induced by the rapid fluctuations of the aqueous and blood glucose in coming into equilibrium, an osmotic-pressure difference is created between the aqueous and the vitreous with the tendency on the part of the relatively concentrated aqueous to abstract fluid from the vitreous, which has a much lower glucose value. The operative procedures in common use for the relief of glaucoma, namely, iridectomy and various types of filtration operations, apparently do not materially influence the glucose level of the aqueous or vitreous in relation to the blood glucose in the fasting state. The action of the miotic, eserine, is such that the normal glucose level of the aqueous is not altered; yet it facilitates the diffusion of glucose into the aqueous from the blood stream. Atropine apparently impedes the diffusion of glucose from the blood into the eye.

The close relationship between the intraocular pressure and the state of the capillary bed of the uveal tract is shown in the graphs obtained following trauma to the iris. Slight iritic irritation may produce a sharp rise in intraocular pressure; or a rise in intraocular pressure (fig. 3) may be followed by a subsequent rise in pressure. This has been explained as a vascular crisis by Duke-Elder and offered as a factor in the production of an acute glaucomatous attack.

Conclusions

1. In fasting rabbits under dial-Ciba anesthesia the blood sugar averages 137 mg. percent, the aqueous sugar 164 mg. percent, and the vitreous sugar 104 mg. percent.

2. Changes in the glucose level of the blood are reflected after a lapse of time in the intraocular fluids. An increase in the glucose content of the aqueous increases the osmotic pressure in the anterior chamber, and with the subsequent fall of the blood-sugar level the accumulation of glucose in the aqueous causes the inflow of fluid into the anterior chamber with a subsequent rise in intraocular pressure. The relatively lower osmotic pressure of the vitreous humor facilitates the passage of fluid from the posterior to the anterior segment of the eye.

3. Eserine increases the rate of the diffusion of glucose into the aqueous of the eye.

4. Atropine retards the diffusion of glucose into the aqueous humor of the eye.

5. Irritation of the vascular bed of the uveal tract is associated with wide fluctuations in intraocular pressure. These fluctuations are due to vascular dilatation or constriction and also to alterations of the permeability of the capillary membrane.

640 South Kingshighway.

Bibliography

[1] Ask, F. The sugar of the aqueous humor of man. Bioch. Zeit., 1914, v. 59, pp. 35-62.
[2] Dieter, W. The relationship between osmotic pressure, blood pressure, especially capillary pressure, and intraocular pressure. Arch. f. Augenh., 1925, v. 96, pp. 197-264.
[3] Duke-Elder, W. Stewart. The nature of the intraocular fluids. Brit. Jour. Ophth., 1927, Monograph Supplement No. 3.
[4] Adler, F. H. An investigation of the sugar content of the ocular fluids under normal and abnormal conditions, and the glycolytic activity of the tissues of the eye. Trans. Amer. Ophth. Soc., 1920, v. 28, p. 307.
[5] Walker, A. M. Comparison of the chemical composition of the aqueous humor, cerebro-spinal fluid, lymph, and blood from frogs, higher animals, and man. Jour. Biol. Chem., 1933, v. 101, p. 269.
[6] Cameron, A. T. Textbook of biochemistry. Ed. 4, New York, The Macmillan Company, 1933, p. 317.

KERATOCONJUNCTIVITIS WITH ADENITIS IN CALCUTTA

SARADINDU SANYAL, M.B.
CALCUTTA, INDIA

A detailed description of the various forms of an ocular affection manifesting protean appearances is given, together with the differential diagnosis from trachoma, vernal conjunctivitis, angular conjunctivitis, and follicular conjunctivitis.

A form of keratoconjunctivitis with adenitis is described which has probably been in existence for a long time but of which no adequate description has been found. It occurs in the following forms:

Acute. In the acute forms, if the case is mild, there is hyperemia of the upper and lower palpebral conjunctivae with a sensation of foreign body in the eye, or slight itching and lacrimation. The lids are more or less swollen with scarcely noticeable discoloration. On everting the upper lid, either at the inner or outer angle and at the junction of the tarsal conjunctiva with the fornix, small areas more hyperemic than the rest and slightly elevated are visible in which one or two deeply situated, yellowish pinpoint areas may be seen, surrounded in many cases with small granules about the size of a pinpoint. In some cases, several more superficial areas are seen at these sites. A discharge is either not noticed by the patient or is very slight.

In some more acute forms the lids are discolored, assuming a more or less dusky hue. The veins become more prominent. There may be complete obliteration of the fronto-orbital fissure, the upper lid overhanging the lower lid to a certain extent. The lid margins may be reddened and this discoloration may extend for about 2 or 3 mm. In some cases there is excoriation of the lid margins along the whole border, especially at the angles. These lid symptoms are more common in children and young women than in adult males. The bulbar conjunctiva is injected, either completely or the injection may end at a certain distance from the cornea. Sometimes there is chemosis, but it is never great. Essential lesions are seen in the upper and lower palpebral conjunctivae and take the following forms:

(1) Deeply seated pinpoint areas, surrounded by granules, at the inner and outer angles. (2) There may be several irregularly shaped yellowish superficial areas, varying from 1 to 3 mm. in diameter, separated from one another by reddish normal conjunctiva. Such areas are more common in the retrotarsal fold. (3) The whole of the conjunctiva may be studded with pinpoint, deeply situated, yellow spots, surrounded by a reddish-yellow area. (4) Sharply limited irregularly shaped yellow areas may be surrounded by dilated blood vessels which never cross it. (5) There may be a combination of the three. (6) The lower lid may show granules resembling follicular conjunctivitis. (7) Occasionally, on the lower tarsal conjunctiva, a bleblike area more or less quadrilateral in shape may be seen. This area is raised from the other portion of the conjunctiva and is highest near the lid margin, gradually merging with the fornix. It is generally 5 or 6 mm. in the anteroposterior diameter and 2 or 3 mm. in breadth. The color is partly yellow and partly red. They are seen in moderately severe cases. (8) Localized areas of necrosis surrounded by edema and intense congestion are occasionally seen on the bulbar conjunctiva. In such cases the yellowish spots are on a lower level than the other portions of the conjunctiva and the whole of the bulbar conjunctiva is injected. (9) Localized noninflammatory edema of the bulbar conjunctiva, most conspicuous in the upper and lateral quadrants, is seen when the yellow spots are on the upper external commissure. These edemas are painless, which distinguishes them from the edema due to styes or chalazion.

Discharge is rare or scanty, in most instances, but a whitish discharge may collect at the inner angles and excoriate the skin.

Subconjunctival hemorrhages of the bulbar and upper palpebral conjunctiva occur. Those of the latter are more common and occur in the form of circular or flame-shaped areas along the course of the dilated capillaries. These hemorrhages are more common near the yellowish areas although when there is intense congestion they may occur elsewhere. Hemorrhages under the bulbar conjunctiva are less frequent but are occasionally seen, especially in children.

Glands involved. Generally the preauricular gland is enlarged. The increase in size is almost inversely proportional to the age of the patient. The gland is generally slightly tender to pressure and the skin over it is mobile. Skin sensitiveness is seen oftener in females and children. Redness of the skin over the gland with suppuration of the gland also occurs but is very rare. Earache in connection with the glandular involvement has been noted.

Number of eyes affected. Monocular affection is as common as the involvement of both eyes; the latter occurs either simultaneously or within a few days' interval. Sometimes during the convalescence of one eye the other becomes involved. The bilateral affection in children sometimes makes it difficult to distinguish from acute conjunctivitis.

Constitutional symptoms. There is generally freedom from constitutional symptoms in the adult. In adolescent girls, occasionally, a rise of temperature may occur. In children under five years of age, there is a slight rise of temperature (99 to 100° F.) with coated tongue and constipation, although apyrexal cases are not rare. Very rarely, enlargement of the spleen and liver with jaundice may occur. In infants under six months of age, death may supervene.

The onset may be heralded by (1) no symptom, or when it has progressed to a certain stage, the heaviness of the lids and redness of the conjunctiva may attract the attention; (2) sensation of a foreign body generally at one or the other angle in the upper lid where the essential lesions are found. Apparently this is due to the dilation of the local blood vessels; (3) an intense itching sensation without an awareness of anything having befallen the eye.

Symptoms complained of are (1) a burning sensation which may be constant or periodic occurring at certain hours of the day; (2) itching, which may be occasional or incessant and so intense as to give no peace. This itching is characteristic and when present at once points to the diagnosis, even in the bilateral cases with discharge; (3) photophobia; (4) pain.

Involvement of the cornea occurs in the acute and subacute forms and the bulbar conjunctiva is always affected. The changes in the cornea are: (1) oily appearance of the cornea without a definitely localized lesion; (2) superficial keratitis in one of the following forms: a. Punctate—already described in a previous communication (Amer. Jour. Ophth., 1933, August, p. 750). Briefly, the whole cornea is studded with superficial roughly circular punctate areas. b. Disciform—a centrally situated white area the depth of which may lie between the epithelium and Bowman's membrane or deeper unaccompanied by vascularization. c. Interstitial—diffuse haziness of the cornea unaccompanied by vascularization. d. Irregular areas scattered on the cornea. e. Linear—situated anywhere on the cornea. f. Ulcerations, such as (i) loss of superficial epithelium of a portion of the cornea, causing loss of luster; (ii) sickle-shaped ulcer near the margin; (iii) single punctiform ulcer situated either at the margin or at a slight distance from it, sometimes accompanied by superficial vascularization from the conjunctiva; (iv) areas of necrosis situated anywhere on the cornea; the necrotic mass of cornea, cheesy in appearance, comes out easily when lightly touched with a cotton-wool swab, and the process of degeneration, if it penetrates deeply, may cause perforation and prolapse of the iris; sometimes the whole cornea is sloughed out. The progress is generally slow; panophthalmitis due to perforation has not been seen; (v) hypopyon ulcer without any undermining of the edge of the progressive margin.

Vascularization sometimes occurs with-

in a few days of the onset of acute symptoms and as early as on the third day is observable with the corneal microscope as vascular loops just crossing the limbus. This may not occur over the whole of the upper limbus but only at certain points. Generally, it occurs in the subacute forms. This vascularization is preceded by infiltration as in trachoma; it generally begins at the upper quadrant and may cover the whole cornea.

Chronic. This is one of the most common forms in Bengal and is almost always bilateral. It may be classified into the following distinct types: (1) Chronic conjunctivitis, with the following symptoms: a slight discharge, lacrimation, frequent recurrence of the subacute forms, a burning sensation, chronic photophobia, and so forth. (2) Vernal conjunctivitis, characterized by swelling and the gelatinous appearance of the cornea at certain points at the limbus or completely surrounding it, accompanied by intense itching, photophobia, lacrimation, and swelling of the preauricular glands. On everting the lids yellow spots are seen. (3) Angular conjunctivitis, manifesting erosion of the epithelium at the angles with a velvety appearance of the palpebral conjunctiva. (4) Trachomatous, in which when pannus develops on the cornea it is indistinguishable from that of trachoma and, accompanied by hypertrophied papillae, the picture of trachoma is complete. The lid, however, is not thickened and no other complications of trachoma are found. (5) Follicular, manifesting irregularly distributed follicles with little or no discharge. (6) Chalazion type, in which fairly large tumors are seen which are distinguished from the ordinary type by their general location near one side. The mouth of the chalazion is surrounded by numerous yellowish areas with no signs of acute inflammation at any stage of its development.

Appearance of yellow spots in chronic forms

The bulbar conjunctiva is generally free from any injection. The palpebral conjunctiva may show: (1) Small deeply situated yellow dots at either the medial or the outer side of the tarsal conjunctiva with localized congestion and small granulation. (2) Superficial areas of yellow spots irregular in shape and free from any blood vessels, also separated from one another by normal conjunctiva. These are especially seen in the retrotarsal folds and the upper end of the tarsus. (3) Two or three yellow spots about 2 or 3 mm. in diameter and encircled by dilated blood vessels which separate them from the normal conjunctiva.

Pigmentation of the conjunctiva

This is generally in the upper palpebral conjunctiva and is common in chronic cases, especially in old people and occasionally in children. It may occur anywhere on the tarsal conjunctiva, generally in small groups. There may be a diffuse area of pigmentation, measuring 3 to 4 mm., occasionally linear in type, beginning at the medial and proceeding to the lateral side in the form of a band.

Differential diagnosis

The monocular type does not present much difficulty. The bilateral type, however, is to be distinguished from other types of conjunctivitis, in that its objective signs are out of proportion to the symptoms, yellow spots, and scanty discharge, as follows:

Trachoma: absence of true granulation, scarring, and complications.

Vernal conjunctivitis: glandular enlargement and yellow spots, if present.

Angular conjunctivitis: Excoriation of the angles with glandular enlargement and yellow spots is not very rare and may make it difficult to diagnose. In such cases the presence of yellow spots and glandular enlargement settles the diagnosis.

Follicular conjunctivitis: The subacute forms are easily distinguished by the essential lesions. Acute Koch-Weeks conjunctivitis may supervene upon chronic types. The copiousness of the discharge and the smear preparations settle the diagnosis.

Prognosis

If the cornea is not affected, acute symptoms are cured under treatment in two to four weeks. The involvement of the cornea makes the prognosis graver, but unless the cornea is severely affected, the prognosis as regards vision is quite good. Recurrences with corneal involvement, either in the nature of superficial punctate keratitis or with small erosions, are not rare. In simple keratitis, the vision is not much affected except temporarily; in recurrent ulcers, the vision becomes poorer. In very old people and in very young children, since there is danger of extensive ulceration, the prognosis should be guarded. Chronic types with no symptoms do not contraindicate intraocular surgery.

Course

Unless adequately treated the disease may run for years in a subacute or chronic form with seasonal affections. Cases have been seen in which there was a history of an acute attack for ten to twelve years. In chronic forms it may run for years and is especially seen in old people.

Treatment

If the yellow spots are not numerous the best treatment for the acute forms is excision. If there are numerous yellow areas, either 0.25-percent iodine in glycerine, once a day after cocainization, or zinc, alum, and methylene-blue drops and yellow ointment are best. In acute cases, intravenous injection of an aqueous solution of iodine does much good. In chronic cases glycerine and tannic acid (2 percent) is good. If there is much itching, calcium gluconate in dram doses may be given. In cases of keratitis, if the spots are not numerous nor extensive, touching the points with tincture of iodine causes a quick disappearance of the keratitis. Ulcerations of the cornea respond to bismuth subgallate (gr. v) together with hydrargyri oxidum flavum (gr. .5), cocaine alkaloid (gr. ii) and vaseline (dr. iv) in the form of an ointment. For pannus, the excision of a small piece of the superficial portion (about 2 mm.) of the cornea near the limbus causes its quick disappearance.

Epidemiology

The age of affected individuals ranges from 3 months to 70 years. Chronic types have been seen in children over 5 years of age and are very common in people over 50 years.

Sex: Both sexes seem to be equally affected.

Eyes: No special predominance of either side has been noted.

Histopathology

Method of collecting the material. The eye was thoroughly washed with warm normal saline after cocainization with a few instillations of a five-percent aqueous solution of cocaine hydrochloride.

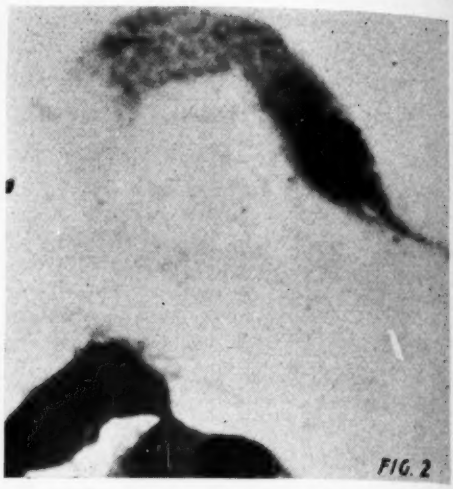
(1) For smear preparations, the upper lid was everted and the epithelium scraped by means of a sterile cataract knife. The slides taken were fixed by heat, methyl alcohol, and Schaudin fluid for Gram's, Giemsa's, and iron hematoxylin stains.

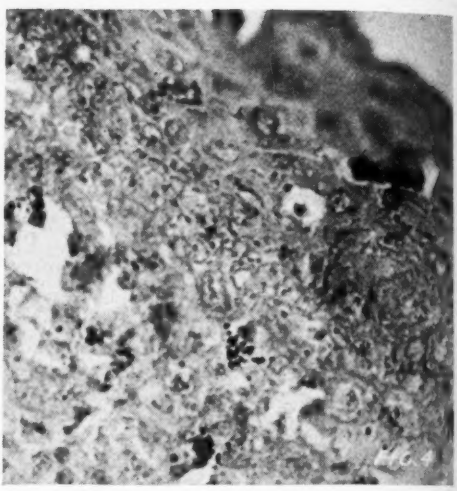
(2) For sections of the conjunctiva, a small piece of tarsal conjunctiva was excised, including the yellow spots, and fixed in Bounin's fluid. Paraffin sections were made.

(3) For sections of the cornea, a small piece of the cornea about a millimeter in breadth and including a small portion of the substantia propria was shaved off by means of a cataract knife, about a millimeter from the limbus. In very acute cases no sectioning was done; subacute, chronic, and mild forms were sectioned for study. After sectioning, the wound was touched with tincture of iodine and bandaged for 12 hours. Tissues were fixed in Bounin's fluid, and several paraffin sections made.

Smear preparations. The Gram-stained preparations showed the bacteria to be small cocci varying in size from 0.25 μ to about 5 μ in diameter, either free or lying within the cells.

The Giemsa-stained slides showed cocci stained reddish blue and slightly alcohol fast (about 1 sec.). The appearance of the epithelial cells by Giemsa stain varied according to the amount of infection in each cell. Sometimes the





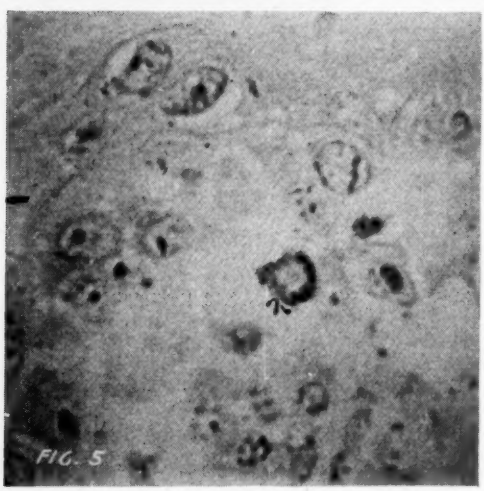


Fig. 1 (Sanyal). Shows a small area of degeneration extending to the surface which appears clinically as yellow spots.

Fig. 2 (Sanyal). Epithelial cells stained by iron hematoxylin; several cocci are seen above. Below the cell on the right hand shows an homogeneous black mass lying on the cell (smear preparation). ×1600.

Fig. 3 (Sanyal). Section of the conjunctiva showing several groups of cocci lying free or in the cell in the subepithelial layers. ×1010.

Fig. 4 (Sanyal). Section of the cornea looking like spring catarrh. Note several groups of cocci in the substantia propria and also several single cocci. The papillary hypertrophy and swelling of the epithelium are also seen. ×610.

Fig. 5 (Sanyal). Section of the cornea showing pannus. An endothelial leucocyte is seen lying within the capillary which has taken on a granular appearance. Outlines of epithelial cells are indistinct owing to partial degeneration.

whole cell was dotted with red-stained bacteria and in other cases the distal end was reddish and swollen with numerous cocci within the area. Where three or more cells were grouped together, each cell was seen to be surrounded by a red border. In other cells some red dots were seen to have crossed the border line and entered the protoplasm. In no case were bacteria seen to have attacked the nucleus, which retained its shape and size till the whole cell began to show signs of degeneration. Giemsa stain gave the best view of the cocci.

In iron hematoxylin preparations several manifestations appeared: (a) homogeneous black areas of different shape and size lying in different portions of the protoplasmic area with no distinct cocci visible; (b) black areas and black-stained cocci; (c) the whole protoplasm studded with black dots.

Sections. The cellular elements were chiefly plasma cells, mononuclear leucocytes, and edothelial cells of which plasma cells formed about 90 percent. Endothelial leucocytes were more numerous in the subepithelium. The epithelial cells were most affected and were found to be in different stages of degeneration reacting faintly to the stain but still retaining the cellular outline. Vacuolation, either partial or complete, and loss of cell structure were found scattered everywhere in the epithelium. In some places groups of cells were seen to have undergone a fatty degeneration surrounded by more or less healthy cells. In other places islands of healthy cells were seen lying in an area of extensive degeneration. When the degenerated areas lay more superficially, they appeared as yellow spots clinically (figs. 1 and 2).

Papillary hypertrophies are common in acute and subacute cases. In a few cases follicle formations were seen.

Repeated minute sectioning of the tarsal conjunctiva stimulates the formation of the fibrous tissues and disappearance of the cocci from the tissues, although the papillae and the follicles may not disappear at the same time. Fibrous-tissue growth is not a feature in these cases, even in the subacute and chronic forms. In chronic cases the degenerative changes are the same, but cellular infiltrations are of a milder character. In old cases pigment was seen. In this layer the cocci were seen as minute dots within the epithelial cells or endothelial leucocytes or free in the degenerated area.

The subepithelial layer took the stain more brightly and the different cellular elements were distinctly recognizable. The large endothelial leucoytes were seen to be heavily infected so that they took on a dotted appearance. Some of these burst and became disintegrated so that a group of bacteria was observed lying free partly surrounded by it. In some places no trace of any leucocyte was seen, and the cocci were free in this layer (fig. 3). In the glandular layer, they were found within the lymphatic glands either infecting the cells or lying free in the lumen. Sections stained by the iron-hematoxylin method showed in addition some endothelial leucocytes which were partially stained a homogeneous black. The coccus in the epithelial cells was considerably smaller than in the subepithelial layer.

In sections of the cornea, round-cell infiltration predominated and here also the epithelial layer was chiefly affected, the substantia propria less so, as evidenced by the staining reactions. The epithelium showed varying degrees of degeneration. In places the cell outline was indistinct. The cocci were found within the epithelial cells and free in areas of degeneration. A few polymorphonuclears were also seen. Cocci were likewise found in the substantia propria either free or in groups (fig.4).

In pannus, the blood vessels were found within the epithelial layer and did not penetrate the substantia propria. In association with vascularization, the cocci were found in the epithelial layer and substantia propria. Occasionally endothelial leucocytes were found in the blood vessels containing the cocci (fig. 5). In pannus the cellular infiltration is not great. In cases which clinically looked like spring catarrh, there was, in addition to infiltration and invasion by the cocci, papillary hyper-

trophy and edema of the epithelium of the cornea at the sclerocorneal junction on its inner side (fig. 4).

Summary

A form of keratoconjunctivitis with adenitis is described which in its protean manifestations resembles many known diseases of the conjunctiva and cornea with which it has been confused but which bacteriologically is shown to be the same disease.

Pannus in a case of conjunctivitis in man is regarded by most authorities as the strongest evidence that the disease is trachoma. In guinea pigs and rabbits a form of conjunctivitis with pannus occurs naturally; it has also been experimentally reproduced. This pannus differs from the pannus of hypersensitiveness in being unable to produce curtain pannus.[1] The disappearance of the bacteria by small tarsectomies, whereas clinically the granules persist, and the production of greater amounts of fibrous tissue raise an interesting point in trachoma, that probably many cases are spontaneously cleared of bacteria although clinically the signs persist.

It will be seen that the corneal affections are different from the epidemic superficial keratitis[2] which has been described previously. The monocular phase formed the subject matter of another paper.

In conclusion my best thanks are due to Dr. H. N. Ray, protozoologist, University of Calcutta, for the excellent photomicrographs and many helpful suggestions.

19 Hari Ghosh Street.

References

[1] Morris, M. C., and Julianelle, L. A. A study of an ocular infection induced experimentally with Bacterium monocytogenes. Amer. Jour. Ophth., 1935, v. 18, p. 535.
[2] Sanyal, S. Epidemic superficial keratitis. Amer. Jour. Ophth., 1933, v. 16, May.

ORTHOPTIC TREATMENT OF STRABISMUS

J. L. BRESSLER, M.D.
HOUSTON, TEXAS

Orthoptic treatment for the correction of strabismus has begun to assume such importance that a knowledge of its methods and routine is becoming increasingly necessary as a part of the equipment of the ophthalmologist.

Orthoptic treatment is frequently useful not only in correcting strabismus as the only means employed, but also in combination with surgery, when it commonly leads better results than surgery alone.

Cases must be carefully selected for this method of treatment; it has definite limitations, is not a cure-all. From the orthoptic clinic of the Illinois Eye and Ear Infirmary. Read before the Chicago Ophthalmological Society, February 17, 1936.

The value of orthoptic treatment has of late been assuming much importance in the daily routine of many ophthalmologists. In this paper the details of routine, methods, and instruments used will be omitted. These were fully discussed in a paper presented by the writer before the Illinois Medical Society last spring and published in the September, 1935, edition of the Illinois Medical Journal. It is intended, however, to consider the subject in a general manner, evaluating not only the usefulness of orthoptic treatment in correcting strabismus without operation but also its extreme usefulness and almost absolute necessity following surgery.

A word of warning and advice will not be out of place at this point: It would be well not to expect every case of strabismus selected for orthoptic treatment to respond rapidly and end in a cure; for disappointment with the treatment, and certainly with the results will follow. To anticipate good results, favorable cases must first be selected. In our clinic the selection of cases is guided by a set of restrictions pointed out in the aforementioned paper.

The management of the actual treatment presents many difficulties. The question arises as to whether the orthoptic treatment should be personally administered by the ophthalmologist or whether the technical part of the work should be delegated to an assistant or technician trained for it. If the ophthalmologist intends to do any orthoptic training in his office and expects to get results, he must have a complete knowledge not only of the routine and methods of the treatment, but also of the physiology and mechanics of the various ocular muscles involved. Orthoptic treatment is time-consuming and requires considerable patience. To be a very good ophthalmologist does not necessarily make one a good orthoptician. In my opinion the actual work of training the patient should be delegated to a technician carefully and thoroughly trained to do this work. The role of the ophthalmologist should be that of director and supervisor. He should be the one to indicate the type of treatment the patient is to receive; the selection of treatment should not be left to the technician. He must thoroughly understand every step and phase of the problems encountered in the orthoptic treatment of strabismus or his efforts will result in failure.

It has been my good fortune to be associated with an institution where large numbers of strabismus patients are cared for each year. Due to this fact, it has been possible to compile a large number of cases exemplifying the various groups for comparison. In the study of these cases, it was found that they could best be considered under three categories, as follows: Group 1. Cases in which surgery was performed, but no orthoptic treatment given either before or after the operation. Group 2. Cases in which surgery was performed, orthoptic treatment having been given only after the operation. Group 3. Cases in which surgery was performed, and orthoptic treatment given both before and after the operation.

The data for these groups are tabulated in tables 1, 2, and 3, respectively.

Although the few comparative fig-

Table 1

GROUP 1. SIXTY-FOUR CASES. SURGERY NOT COMBINED WITH ORTHOPTIC TREATMENT

Deviation		Fusion	
Straight	22	None	58
Undercorrected, 1–15°	19	3d degree	1?
Undercorrected, over 15°	11	2d degree	1
Overcorrected	12	1st degree	4

Table 2

GROUP 2. FIFTY-NINE CASES. SURGERY FOLLOWED BY ORTHOPTIC TREATMENT

Deviation		
Before Treatment		After Treatment
Straight	5	16
Undercorrected	35	24
Overcorrected	19	19
Fusion		
None	50	38
3d degree	3	12
2d degree	0	3
1st degree	6	6

Table 3

GROUP 3. FORTY CASES. SURGERY COMBINED WITH ORTHOPTIC TREATMENT BEFORE AND AFTER THE OPERATION

Deviation			
Before Operation 18° to 40°		After Operation	
		Straight	17
		Undercorrected, 1–15°	16
		Undercorrected, over 15°	5
		Overcorrected	2
Fusion			
None	24	None	11
3d degree	3?	3d degree	12
2d degree	2	2d degree	3
1st degree	11	1st degree	14

ures just presented do not indicate very high percentages, they are nevertheless striking when the type of patients and parents dealt with at our free clinics is taken into consideration. The mentality and coöperation of the children are low, that of the parents even lower. In private practice results should be very much better, and usually are.

An analysis of the figures presented in the table makes apparent at once the influence of orthoptic treatment on the end results. Of the patients treated before and after surgery, nearly 40 percent gave evidence of some degree of fusion before operation, and nearly 75 percent had some degree of fusion after operation. These observations were made only a short time after the operations and are not final. Since then, many of the patients without fusion and many with a small degree of fusion have de-

veloped full fusion with stereopsis. Many of the others will show greater improvement in time. The influence of orthoptic exercise can also be demonstrated in the cases in the second group. With treatment after surgery 11 more were straight and 12 more had developed fusion.

The following three case reports illustrate some of the work to which reference has been made:

Case 1. C. C., aged three years, came to us on November 27, 1933, with a history of having had squint for the past 15 months. She had worn glasses since the onset of squint.

There was an alternating esotropia, the deviation with glasses being 10 degrees, without glasses 15 degrees. Vision in the right eye was 20/25, in the left eye 20/30. With glasses, O.U. +1.25 D. sph., vision was 20/20 in each eye. Fixation and motility were good. As to fusion, at times there was superposition of objects.

On December 9, 1933, daily orthoptic treatments were begun. By March 26, 1934, there was no deviation, some evidence of esophoria being present. Fusion of all grades with stereopsis had been developed. Vision was now 20/20 – 1 in each eye. No glasses were worn.

Comment: This is a case of corrected strabismus with elimination of the deviating angle and development of fusion without recourse to surgery.

Case 2. O. B., aged 28 years, was admitted to the orthoptic clinic on February 11, 1935, with a history of having had eyes that turned in since she was four years old. She had never been treated for the condition and had never worn glasses.

There was an alternating esotropia of 30 degrees. Vision was O.D. 20/30, O.S. 20/25. With a correction of O.D. +0.75 D. sph., O.S. +1.00 D. sph. vision was improved to 20/20 for each eye. No glasses were prescribed. Motility and fixation were good.

Orthoptic treatment was instituted but abandoned on March 29th, because there was no improvement. On that day the right eye was operated upon, a recession of the internal rectus with resection of the external rectus being performed. On April 17, 1935, the eyes were parallel, and orthoptic treatment was resumed. By April 29th, simple fusion had been developed. Now all grades of fusion with stereopsis and parallelism are present.

Comment: This case illustrates a strabismus corrected by means of surgery, and development of fusion after the operation by means of orthoptic exercise.

Case 3. J. J., aged seven years, came to us on February 12, 1934, because of eyes that had turned in since she was four years old. Glasses had been worn for the past two years, and for the last year she had had orthoptic treatment elsewhere.

There was an alternating esotropia. The deviation with glasses was 26 degrees, without glasses 35 degrees. Vision was 20/25 in each eye. With the glasses she was wearing, O.D. +4.75 D. sph. $\bigcirc$ +2.00 D. cyl. ax. 180°, O.S. +5.25 D. sph. $\bigcirc$ +2.00 D. cyl. ax. 180°, vision was 20/20 in the right eye and 20/25 in the left eye. Fixation and motility were good. Fusion was absent.

Orthoptic treatment was instituted and continued for several weeks but during this time the eyes showed a tendency to become worse, the angle at times being as high as 45 degrees.

On April 27, 1934, the left eye was operated upon. A recession of the internal rectus with a Reese resection of the external rectus was performed. On May 21st, the remaining deviation varied from 4 degrees with glasses to 20 degrees without glasses.

Orthoptic treatment was started about two weeks after the operation. On August 27, 1934, the eyes were parallel with and without glasses. Fusion of all grades including stereopsis is now present. With glasses vision is 20/15 in both eyes.

Comment: This is an example of a case of corrected strabismus in which surgery was performed, resulting in a marked undercorrection. Orthoptic treatment precluded the necessity of further surgery.

Conclusion

The data presented tend to show that orthoptic treatment should not be judged by its percentages of cures of strabismus with nonoperative treatment alone, but should also be considered for its value both before and after surgical correction for deviation.

1328 Medical Arts Building.

VISUAL TASKS IN SIGHT-SAVING CLASSES

MATTHEW LUCKIESH, PH.D., AND FRANK K. MOSS, PH.D.
CLEVELAND

The classification of low-vision subjects by the criterion of visual acuity may result in serious inconsistencies with respect to the actual visual efficiencies of the individuals. Visibility measurements are fundamentally sound and provide knowledge of broader significance and greater practical value. From the Lighting Research Laboratory, General Electric Company.

The sight-saving class presents an appealing opportunity for increasing visual efficiency and ease in seeing through (1) the correction of ocular deficiencies, (2) the provision of adequate light and proper lighting, and (3) the regulation of visual tasks in accordance with the visual ability of the subject. These are the controllable phases of seeing and, in this case, the restrictions upon complete control which are often imposed by so-called practical considerations are reduced to a minimum. The present discussion pertains largely to the third controllable phase, in so far as it is possible to separate these intimately interrelated factors. Obviously, such a separation is chiefly an expedient of discussion.

Since it is reasonable to assume that reading constitutes the major critical visual task in the classroom, the discussion is further restricted to this task. The textbooks used in sight-saving are commonly printed in either 18-point or 24-point type and upon nonglossy white paper. Thus the physical characteristics of the important visual tasks performed by the pupils are definitely describable and hence subject to quantitative analysis. Furthermore, it may be stated that there is no general agreement as to the size of type best suited to the needs of the sight-saving pupils. It is probable that the problem of optimum type-size has been complicated by economic considerations. For example, the cost of books printed in 24-point type is said to be about three times as great as that of books printed in 18-point type. Such a differential in cost is significant only when it is compared to the differential in ease of seeing in the two cases. Obviously, ambiguity in the latter overemphasizes the importance of the former. In general, economic factors have not been considered in the present discussion of optimum type-size.

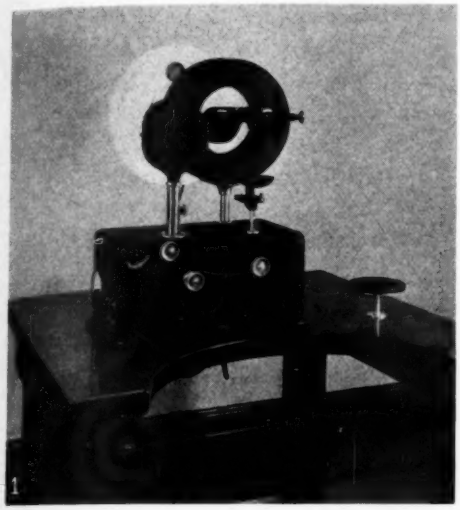
The subjects for this investigation included 72 pupils in the seventh, eighth, and ninth grades of sight-saving classes located in four different schools. Ten adult subjects possessing normal or near-normal vision were also used in order to permit the appraisal of the results obtained upon an absolute basis as well as upon a relative one. Type-size, as a factor in seeing, was appraised by visibility measurements made with the Luckiesh-Moss Ophthalmic Sensitometer.

This instrument[1] (fig. 1) consists essentially of two colorless photographic filters with precise circular gradients of density which may be rotated simultaneously in front of eyes looking at an object or performing a visual task. The observer holds the instrument in approximately the same position that eyeglasses are worn, and with the right hand slowly turns a disc that rotates the circular gradients until the visual threshold or limit in the performance of the visual task is reached. The procedure is quite similar to that employed in operating a visual photometer. Individual measurements of visibility

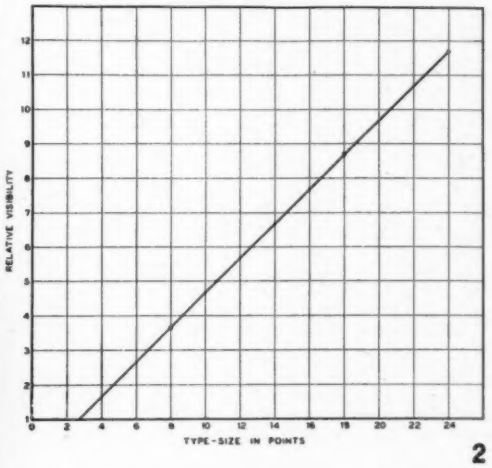
may be made in a few seconds even by untrained observers. Obviously, the reliability of the appraisals of the relative visibility of various objects is proportional to the number of observations involved; assuming, of course, that obvious precautions are exercised.

The gradient filters not only reduce the apparent brightness of the visual field due to absorption, but also lower the contrast between the object of regard and its background due to the slightly diffusing characteristics of the photographic filters. The slight diffusion produces the effect of a "veiling" brightness over the field of view. The brightness of the retinal image may be varied by the gradient filters over a range which corresponds to 100 percent in visual acuity or the threshold size of the object of regard. Since the maximum range of the instrument corresponds to 20 times the threshold size, it is seen that the reduction in contrast is the more effective of the two factors in producing threshold conditions. Obviously, the state of retinal adaptation is a function of the density of the filters before the eyes. Since this variable is present in both the calibration and the use of the instrument, it does not introduce differential effects in the measurement of relative visibility. The range of our standard visibility meter is designed for everyday seeing conditions indoors in the daytime and under artificial lighting at night.

A fundamental characteristic of the visibility-meter technique is that all observations involve threshold stimuli and therefore represent the *same degree of visibility*. Since differences in the visibility of various objects of regard may be compensated by altering the position of the gradient filters before the eyes, the relative visibility of an object may be expressed as a function of the density of the filters producing threshold conditions. Furthermore, the effectiveness of the filters in altering visibility is not a function of the distance, size, brightness, nor color of the object of regard. It follows, *a priori*, that the determination of the relative visibility of



1



2

Fig. 1 (Luckiesh and Moss). The Luckiesh-Moss ophthalmic sensitometer. A device for diagnosing and determining ability to see by means of measurements involving brightness-difference as a criterion and involving a technique for prescribing various controllable aids to seeing.

Fig. 2 (Luckiesh and Moss). The relationship between type-size and visibility as determined by means of the ophthalmic sensitometer. The plotted points represent average values derived from 250 observations made by each of 15 subjects possessing normal or near-normal vision. The measurements were made with a level of illumination of 10 foot-candles on the black print on a background of suitable white paper.

various objects, for the specific conditions under which they are viewed, is independent of the conditions under which the instrument is calibrated. This conclusion involves the assumption that the scale of relative visibility is based upon the characteristics of the visual sensory processes. The significance of the scale of relative visibility is augmented if the unit of visibility is a rational rather than an empirical one. Our unit is based upon the resolving power (or acuity) of average normal eyes under certain prescribed conditions for seeing.

Although relative visibility may be expressed in terms of any one of the four fundamental variables of the visual threshold, the factor of areal extent or size possesses certain inherent advantages for this purpose. Visual acuity has long been a means of appraising vision. Besides, such data are easily translated into relative distances at which the various objects are just visible. Hence the significance of such appraisals of visibility is obvious to the vast majority of nontechnical persons whose safety and welfare depend upon seeing and who generally exercise control over conditions for seeing in practice.

Table 1

THE INDIVIDUAL VALUES PRESENTED IN COLUMNS THREE AND FOUR REPRESENT THE AVERAGE OF A SERIES OF 10 MEASUREMENTS OF VISIBILITY UNDER A LEVEL OF ILLUMINATION OF 10 FOOT-CANDLES. THE VALUES GIVEN IN COLUMN SIX INDICATE THE LEVELS OF ILLUMINATION WHICH ARE REQUIRED IN ORDER TO INCREASE THE VISIBILITY OF 18-POINT TYPE TO EQUAL THAT OF 24-POINT TYPE UNDER 10 FOOT-CANDLES.

Diagnosis	Number of Subjects	Visibility			Foot-candles on 18-pt.	Probable Errors	
		18-pt.	24-pt.	18/24		18-pt.	24-pt.
Medium myopia (3–6 D.)	5	7.88	10.16	0.81	15.4	1.8	2.5
High myopia (over 6 D.)	15	5.71	7.90	.73	18.4	2.2	2.6
Simple myopic astigmatism	12	4.22	5.68	.75	19.1	2.2	2.6
Compound myopic astigmatism	3	6.60	9.11	.71	30.9	2.7	3.1
High hyperopia (over 6 D.)	1	6.51	10.33	.63	22.8	1.9	3.1
High hyperopic astigmatism	4	4.55	6.78	.70	20.9	1.8	2.4
Myopia and nystagmus	2	3.96	5.10	.78	13.2	1.0	2.0
Myopic astigmatism and nystagmus	1	1.84	2.78	.66	19.0	0.9	1.8
Hyperopia and nystagmus	1	1.65	1.99	.83	28.0	1.6	2.7
Astigmatism and nystagmus	1	1.86	2.46	.76	24.0	1.5	1.0
Ophthalmic blennorrhea	1	2.24	4.95	.45	26.7	2.0	1.4
Cataracts	2	2.60	4.31	.58	17.0	2.0	3.8
Corneal opacities	6	4.16	5.58	.76	16.0	2.0	2.8
Albino and nystagmus	3	1.45	2.15	.67	21.7	1.6	2.7
Aphakia	1	3.35	4.00	.84	16.6	1.2	0.9
Subluxated lens	1	3.30	3.82	.87	13.7	1.1	1.7
Choroiditis	2	3.89	4.90	.78	15.9	1.8	2.4
Ptosis	1	2.41	3.27	.74	18.5	1.7	2.0
Divergent strabismus	1	6.30	8.07	.78	12.5	1.7	2.1
Choroidoretinitis	1	1.49	2.16	.69	32.0	2.7	3.4
Secondary retinitis	1	5.15	6.43	.80	13.9	1.0	2.5
Old interstitial keratitis	2	4.48	5.29	.84	14.8	1.4	2.4
Optic atrophy	3	2.29	3.16	.72	23.3	2.4	2.2
Choroid retinal scars	1	4.15	6.92	.60	39.0	2.1	1.7
Pigment degeneration of retina	1	1.84	2.18	.84	21.5	2.3	0.9
Weighted arithmetic mean	72	4.50	6.15	.74	19.8	2.0	2.1
Group with "normal" vision	10	8.69	11.68	.75	15.6		

Relative visibility of print

The experimental data are summarized in table 1. At the bottom of the table it will be noted that the average visibility of 18-point type is 25 percent less than that of 24-point type. Thus the visibility of these particular

type-faces is directly proportional to the size of the type expressed in "points." From the fifth column it will be noted that approximately the same ratio in visibility between these two sizes of type is obtained by both the normal-vision and subnormal-vision groups. The ratios obtained by various individuals vary considerably but inasmuch as the probable errors of the data from which these values were computed are of the order of 2 percent, the ratios obtained are reliable from a statistical viewpoint. Thus it is obvious that the same increment in type-size is not equally effective for different individuals. This conclusion is supported, *a fortiori*, by the fact that one subject was unable to resolve 18-point type even though the level of illumination was increased from 10 to 150 foot-candles.

It is assumed that the effectiveness of a given increase in type-size is inversely proportional to the visibility ratio obtained from threshold measurements. Although the effectiveness of a given *increment* in type-size, as a controllable factor in seeing, varies among individuals, it is concluded from these data that the differentials are not large enough to necessitate a quantitative consideration of this fact. Furthermore, it will be noted that the cases in which the visibility ratios between 18-point and 24-point type are markedly lower than the average value, are the exceptional ones. In these cases, the improvement from a given increment in type-size is greater than that obtained in the usual case. In general, it may be concluded that visibility is increased approximately in proportion to the increase in the physical size of the type-face. However, this does not mean that the increments in visibility, in terms of size of object, serve the human seeing-machine in the ratios indicated, as will be noted from the relationship between size of object and visual efficiency approved by the American Medical Association.

Since size and brightness are complementary factors of the visual threshold, a deficiency in the one may be compensated by an augmentation in the other, within certain limits.[2] Hence, it becomes important to determine the differential in level of illumination which is equivalent to a given differential in type-size. In the sixth column of table 1 are shown the levels of illumination required upon 18-point type in order to produce the same degree of visibility afforded by 24-point type under a constant illumination of 10 foot-candles. If average values are considered, it will be noted that 19.8 foot-candles are required for 18-point type when appraised by the subnormal-vision group. The corresponding value for the normal-vision group is 15.6 foot-candles. In general it may be concluded that the difference in size between these two type-faces, may be offset by providing twice the foot-candles on the matter printed from the 18-point type. As a lighting problem, the augmentation of levels of illumination now in general use by a factor of two does not involve either technical or economic difficulties. In fact, much greater increases may readily be obtained by proper considerations of light control and distribution. The foot-candle values discussed in this paper are those involved in the matter of visibility. They are not to be considered as recommendations for sight-saving classrooms. Formidable reasons are available for recommending appreciably higher values for any classroom with its variety of tasks varying greatly in visibility.

Standards of visibility

Obviously, by increasing either type-size or level of illumination visibility is increased. Since optimum degrees of visibility are not obtainable within a practical range of the controllable variables, the specification of definite visual conditions for sight-saving classes involves various compromises. For sight-saving pupils, the appraisal of the benefit derived from higher degrees of visibility is made even more difficult by reason of the serious need of maximal visual assistance. However, these compromises may be made upon a rational basis. Such a basis is herewith presented and applied to the visual prob-

lems of the sight-saving class. As a result, certain "standards of visibility" are indicated.

The data plotted in figure 2 show the relationship between type-size and visibility[3] as determined by ten adult subjects possessing normal or near-normal vision. The intensity of illumination was 10 foot-candles in all cases and the style of type used was a common acceptable one known as Bodoni. The fact that the relationship is a linear one is due largely to empirical factors and may not be assumed for other typefaces. However, the particular function describing this relationship is of minor significance. The important characteristic is that it provides a frame of reference upon which the degrees of visibility obtained under specific conditions by subjects of very subnormal vision may be compared with those obtained by normal-vision subjects. This translation of visibility data, obtained under conditions prevailing in sight-saving classes, to a scale applicable to normal vision and usual tasks, involves certain inherent advantages.

An acceptable standard of type-size is definitely indicated by the characteristics of good typography since these standards have been evolved as a result of mass experience for generations. Furthermore, it seems reasonable to conclude that normal vision has been assumed in the design of type-sizes. Hence the fact that 10-point or 12-point type is used in the better grade of books may be considered as an indication of the desirability of these sizes. Furthermore, it may be assumed that 12-point type represents a practical maximum, since 14-point type is rarely used for the solid text-matter of books designed for adults. It seems obvious from introspective considerations that larger sizes would not be desired by readers possessing normal vision. The specification of an "acceptable standard of visibility" may be based upon the apparently justifiable assumption that *at least* the same degree of visibility should be obtained by sight-saving pupils as that obtained by normal-vision subjects performing an easy visual task in cases where this is possible. For reasons already stated, the authors believe that 12-point type represents such an acceptable standard task, if other factors are adequate, such as brightness and contrast.

It is conceivable that a higher degree of visibility than that which has been designated as an "acceptable standard" may be desirable for sight-saving pupils. Such a standard may be described as a "recommended standard of visibility." If 12-point type under 10 foot-candles is assumed as a minimum standard, then 12-point type under 20 foot-candles might be taken as a possible "recommended" standard of visibility. However, the important fact is that the selection of a specific degree of visibility reduces the problem of specifying type-size for sight-saving pupils to a rational basis.

Let it be assumed, for the moment, that 12-point booktype represents a visual task which is consistent with reasonable ease and comfort in reading if the printing and lighting are suitable. It will be noted from the data presented in figure 2 that type of this size has a relative visibility[1] of about 5.7. Hence this datum may be regarded as "an acceptable standard of visibility" for sight-saving subjects. Furthermore, it will be noted from the average values presented in table 1 that relative visibilities of 4.50 and 6.15 were obtained by the subnormal vision group for 18-point and 24-point type, respectively. Hence it follows *a priori* that 24-point type, illuminated to 10 foot-candles, represents a visual task for the subnormal-vision group which is approximately equivalent in visibility to 12-point type, under the same illumination, for the normal-vision group. Therefore, it seems reasonable to conclude that the sight-saving pupils, *as a group*, are provided about the same standard of visibility through the use of 24-point type (under 10 foot-candles) in so far as this factor is concerned. However, it is emphasized that the method of designating a standard of visibility is the primarily important phase of this discussion and that the standard proposed serves merely as an example and not as a recommendation.

It is now of interest to examine the results obtained by various individuals of the subnormal-vision group. It will

be noted, for example, that the relative visibility obtained by the two subjects with cataracts averaged 2.60 and 4.31 for 18-point and 24-point type, respectively. Obviously, these pupils did not receive the visual assistance from the factor of type-size that is demanded by the standard of visibility which has been assumed to be a rational and conservative one. As tasks for normal eyes, these visibility values correspond to 6-point and 9-point type, respectively, as shown in figure 2. Furthermore, it will be noted that these equivalent type-sizes are reduced to approximately 3.5-point and 5-point, respectively, for the pupils in the lower ranges of visual efficiency. Therefore, it may be concluded that 18-point type, in comparison with 24-point type, cannot be recommended in such cases unless it is possible to augment visibility by some other means.

The data of table 1 also indicate that the tentative standard of visibility—that of 12-point type illuminated to 10 foot-candles—may be obtained by certain subjects from either 24-point type under 10 foot-candles or from 18-point type under higher levels. For example, the group with simple myopic astigmatism obtained a visibility rating of 5.68 from 24-point type under 10 foot-candles, and the same rating from 18-point type under 19.1 foot-candles. Since the "standard of visibility" is equivalent to a rating of 5.7, it is obvious that the type-size may be reduced, for these subjects, from 24-point to 18-point if the illumination is increased from 10 foot-candles to approximately 20 foot-candles. However, it will be noted that a rating of 5.7 in visibility is not attainable by many of the subjects even with the 24-point type. Hence an augmentation of the illumination is the only available means for approaching the assumed standard of visibility. The latter conclusion is based upon the assumption that 24-point type is the largest size practicable.

Theoretical considerations

It seems reasonable to assume that the advantage of higher degrees of visibility resulting from larger type-sizes may be discounted, to some extent, due to (1) the increased muscular effort expended in orientation and fixation during the reading of a given number of words and (2) to perceptual anomalies which may be introduced by the decreased number of letters included in the perceptual span.[4] Furthermore, it is possible that these negative factors may be of such an order of magnitude that a definite optimum in type-size is reached for sizes less than 24-points in certain cases. For example, it will be noted in table 1 that the subjects with medium degrees of myopia indicate visibility ratings comparable to those corresponding to normal-vision subjects. Hence, it may be concluded that 18-point or 24-point type is not required in these cases and that a reduction in type-size might represent a refinement in ocular hygiene. The data of table 1 indicate that the maximum type-size is not required in certain other cases in order to attain an acceptable standard of visibility.

These generalizations do not imply that the utmost refinement is necessary in regulating visual tasks in accordance with the visual characteristics of the individual. Such a procedure, although ideal from a theoretical viewpoint, is obviously impractical in sight-saving classes. However, certain approximations are possible.

By means of the technique already described it is possible to classify sight-saving pupils into a limited number of groups and provide each group with the proper size of type. The latter will be that size which produces the same degree of visibility, when this is possible, as that obtained by subjects of average normal vision from 12-point type illuminated to 10 foot-candles. Obviously, the visibility measurements by the sight-saving pupils are to be made under the same level of illumination as that which prevails or will prevail in the classroom. An analysis of the data presented in table 1 indicates the desirability of at least three different sizes of type.

24-point—For pupils obtaining a visibility rating less than that adopted as a standard with type of this size. In general these pupils require the maximum

in both type-size and level of illumination.

18-point—For pupils obtaining a visibility rating approximately equal to the standard with type of this size.

12-point—For pupils obtaining a visibility rating comparable to that obtained by normal-vision subjects. This classification is based upon the assumption that these pupils are benefited very largely by the practice of ocular hygiene in the sight-saving routine; and to a lesser extent by reason of large type-size.

In the completely controlled situation, the preceding classifications involve the assumptions that refractive errors have been corrected as completely as possible and that the lighting, as the second controllable factor in seeing, is also satisfactory from the viewpoint of modern knowledge and practice. A number of such installations are now in use and have been described in detail elsewhere.[5] It is emphasized that the measurements presented in table 1 were made under a level of 10 foot-candles. This value approximated the prevailing levels of illumination in the classrooms investigated. Some of the recent lighting installations in sight-saving classrooms provide a uniform, diffused, and automatically regulated illumination in the neighborhood of 30 to 40 foot-candles.

The significance of these refinements in sight-saving technique, as they pertain to muscular phenomena, may be appraised experimentally by determining the relationship between type-size and ocular-muscle fatigue by means of measurements made with an ophthalmic ergograph.[6] Such an appraisal would logically precede an actual trial in the classroom. In addition, it is probable that the experimental results would be more decisive if the problem is approached by the former method. The relationship between type-size and perceptual phenomena might be determined, at least indirectly, by "speed of reading" tests or by other criteria of similar significance. Such investigations are beyond the scope of the present one which aims toward immediate practical aid to sight-saving pupils.

Visual efficiency

Since the regulation of visual tasks in accordance with the visual efficiency of the individual is an important phase of ocular hygiene in the sight-saving class, the characteristics of the criteria for appraising visual efficiency are correspondingly important. In ophthalmological practice, visual efficiency is usually expressed as a definite function of visual acuity. However, resolving power is but one characteristic of visual function and, in many situations, it is not the primarily important one. As an extreme example, seeing at night outdoors depends largely upon the ability to discriminate brightness-differences. Furthermore, it can be shown that the latter criterion is the critical one under any lighting condition in visual situations involving test objects which are large in comparison with the spatial characteristics of the retinal mosaic. Although the criterion of visual acuity involves the factor of retinal sensibility, the influence of this variable upon the acuity threshold is relatively slight when high-contrast test objects are used;[7] or in general, acuity is a rather insensitive criterion for revealing dif-

Table 2

THE VALUES GIVEN IN COLUMNS TWO AND THREE WERE DETERMINED WITH THE SNELLEN CHART; AND THOSE OF COLUMN FOUR BY MEANS OF THE LUCKIESH-MOSS VISIBILITY METER.

Subject	Vision Uncorrected	Vision Corrected	Visibility of 24-point type
1	6/60	6/6	6.03
2	6/60	6/6	9.06
3	1/60	6/6	6.43
4	6/60	6/6	13.10
5	Counts fingers	6/7.5	3.55
6	6/60	6/7.5	4.06
7	6/30	6/7.5	5.03
8	6/60	6/7.5	6.55
9	6/60	6/7.5	7.38
10	6/60	6/20	4.84
11	6/60	6/20	6.40
12	6/60	6/20	7.76
13	Nil	6/30	2.78
14	Nil	6/30	6.40

ferences in retinal sensibility among various subjects. Certainly the available knowledge of seeing proves that individuals with the same test-chart rating are not necessarily equivalent in efficiency as human seeing-machines.

The data of table 2 indicate the differences in efficiency ratings obtained among a group of low-vision subjects by the criteria of (1) visual acuity and (2) minimum perceptible brightness-difference.

Although the vision of the first group was brought to 6/6 by eyeglasses, it will be noted that the individuals of this group are far from equal when appraised by means of brightness-difference thresholds. For example, subjects 1 and 4 differ by more than a factor of two in the size of object just visible under threshold brightness-contrasts. Similar results are obtained for the other three groups. Since the probable errors of the values presented in column four are of the order of 3 percent, these data are quite reliable from a statistical viewpoint. However, it might be argued that this difference in "visual efficiency" may be due to perceptual rather than ophthalmic phenomena, since the visibility measurements involved ability to read as a criterion in contrast with ability to recognize single characters. This hypothesis may account for some but not for all of the difference observed, since rather large differences are obtained when single test-objects are used in both cases. Furthermore, if perceptual phenomena are important in these measurements, they are likewise important in performing customary visual tasks.

In obtaining the data upon which this paper is based, the authors wish to acknowledge the coöperation of Dr. S. H. Monson and Miss Olive Peck of the Cleveland Board of Education; and the assistance of Mr. S. K. Guth of our laboratory.

Nela Park.

References

[1] Luckiesh, M., and Moss, F. K. Visibility: Its measurement and significance in seeing. Jour. Frank. Inst., 1935, v. 220, p. 431.
[2] Cobb, P. W., and Moss, F. K. The four variables of the visual threshold. Jour. Frank. Inst., 1928, v. 205, p. 831.
[3] Luckiesh, M., and Moss, F. K. The relative visibility of print in terms of illumination intensity. Sight-Saving Rev., 1935, v. 5, p. 272.
[4] Vernon, M. D. The experimental study of reading. Cambridge University Press, 1931.
[5] Sturrock, W., and Staley, K. Sight-saving classrooms adopted by many schools. Elec. World, 1934, v. 105, p. 90.
[6] Berens, C. A clinical ophthalmic ergograph. Amer. Jour. Ophth., 1935, v. 18, p. 139.
Luckiesh, M., and Moss, F. K. Fatigue of the extrinsic ocular muscles while reading under sodium and tungsten light. Jour. Opt. Soc. Amer., 1935, v. 25, p. 216.
[7] Luckiesh, M., and Moss, F. K. A view of the cortical integrational process through liminal visual stimuli. Jour. Exp. Psych., 1934, v. 17, p. 449.

FAILURES AND SUCCESSES IN THE OPERATIVE TREATMENT OF DETACHMENT OF THE RETINA

THOMAS D. ALLEN, M.D.
CHICAGO

The proper study of detachment of the retina is a careful survey of our cases, both failures and successes. Success is not always possible but successes will increase with the honest facing of the poor results and the study of their probable causes. Read before the Chicago Ophthalmological Society, March 16, 1936.

A critical study of one's own case histories in relation to methods of procedure is one of the best methods of evaluating such treatment as has been instituted. Not only should successes be evaluated but also failures, and the questions asked: Why did this patient recover? Why did this one not recover? What did I do that I should have done, or that I should not have done? And what did I not do that I should have done or that I should not have done? How could I have improved my handling of the case? Which technique should I have used?

First of all, it is necessary to have accurate data, else the study of the case is useless; for example:

Case 1. Some six years ago a patient, Mrs. E. E., aged 30 years, was seen by Drs. Wilder, Jacobs, and me. She had noticed only two weeks before a failure of vision of the left eye. The eye was not and had not been red nor sore, but there were occasional sticking pains in it. Her general health had been good. Vision in the right eye was normal with —0.37 D.sph. and the media and fundus of this eye were recorded as normal. In the left eye with the pupil well dilated a large detachment of the entire lower half of the retina was carefully studied. The retina was gray, billowy (top seen with +11 D.), and moved easily on movement of the eye. No hole was found. The patient was sent to the hospital, kept in bed for several days, and examined repeatedly. The right visual field was normal, the left roughly comma-shaped, 30 by 40 degrees, with the blind spot apparently at the center. Transillumination (Zeiss) was negative. Dr. Gradle saw the patient in consultation and assisted in the operation —an ignipuncture in the inferior nasal quadrant 12 to 14 mm. behind the limbus. The retina returned immediately to place, but in 24 hours it had again detached and on the third day was as bad as at first. Two weeks after the first operation a second one was performed: the Gonin cautery was held in the scleral opening previously made while one of us counted rapidly to 10, probably three full seconds. Immediately examination with the ophthalmoscope was made, and no improvement noted. A complete umbrella-shaped detachment developed, but the patient retained for four months a very small central field in which she saw a 1-cm. target at 33 cm. Since then she has not been seen.

Now, what was wrong? Why didn't we succeed? Was the case as well worked up as it should have been? If not, what should have been done? Certainly the detachment was in the most favorable location for a successful operative result. My criticisms of this case would be about as follows:

1. A history of good general health is not sufficient. A thorough search of the body for so-called foci of infection and their elimination is certainly in order, especially infections in the oral, nasal, intestinal, and genito-urinary systems and in the chest. While syphilis apparently plays a very minor role, the physician should certainly know if the patient has such an infection. A patient who coughs can ruin a perfect operation. Should one find dental disease, it is far better to have teeth extracted before than after the operation, from the standpoint of infection and trauma. The work-up from that standpoint, in this case, done six years ago, was not satisfactory.

2. At that time none of us thought of looking for a hole in the attached portions of the retina, else we might have found one or more holes in the upper half.

3. The actual technique of operating on such a patient has undergone a change in the past several years. In-

stead of one hole in the sclera for drainage and adhesive choroiditis we now try to make many, and instead of the severe cauterization of several seconds, we scarcely more than touch the choroid; certainly few of us sear the vitreous. Also, I wonder about examining the eye within 24 hours of operation.

Case 2. Mrs. E. S., 48 years old, with bilateral high myopia (R. —17.00, L. —18.00) had bumped her forehead, left side, some two weeks before I saw her in January, 1933, since which time she had been able to see shadows only with the left eye—previously the best eye—and had seen many spots before the right eye. She had been treatd for syphilis for seven years by Dr. Esther Rahn, who only the day before had given her mercury intragluteally. The patient had six children, three living and well, two had died in infancy of rickets, the last one died at 17 days, probably of syphilis, as the primary infection occurred just before her last pregnancy. All her teeth had been removed during the previous few years.

Vision O.D. with glasses was 10/200 (less than vision in the left eye), the fields being grossly normal; O.S., was 20/200. A detachment was far out in the inferior temporal quadrant, 8 to 10 disc diameters across. No hole was found. Transillumination was negative (Zeiss). The patient was kept in bed at home one week and then, as no improvement occurred, was taken to Cook County Hospital; after another week in bed no detachment could be seen. After a third week in bed she was gradually allowed up and three weeks later the right vision, with glasses was 20/200; left vision was 20/50— (probably about normal for her as myopic changes crowded the yellow spot).

There was no detachment. She was sent home and seemed normal for two months; then the detachment recurred, even worse than before, as vision in the left eye was reduced to counting fingers. A small, round retinal hole was found and after some 10 days operated upon by the Gonin technique, using the electric cautery. The cauterization was slightly too far back and too high, so the sclera anteriorly and lower down was cauterized lightly. The immediate result seemed to be very good. No intraocular hemorrhage occurred and the retina seemed in place. Soon after the operation the patient ate some soup which upset her and caused considerable vomiting and ocular discomfort.

The first dressing was done on the seventh day. A large intraocular hemorrhage was found. Vision was light projection only. No subsequent improvement was found.

Comments: 1. The general examination had been thorough. The teeth were out and gums were clear. The patient had had proper treatment for her syphilitic infection of seven years' standing. Bed rest was followed by spontaneous reattachment.

2. Recurrence after two months. Was this due to relaxation of vigilance and care? Or was it due to the development of the hole which was then found?

3. The immediate result of the operation was good; but the postoperative hemorrhage probably was due to retching and vomiting.

Case 3. Mr. F. H. L., 61 years old, had first been seen four years previously. This is a case which Dr. Milton Jacobs has kindly consented to have included in this discussion. There was myopia of about 10 and 13 D., and a detachment of four days' duration. Vision in the left eye was reduced to occasional 20/200. The entire upper left retina was detached: two small holes at the 11-o'clock and 2-o'clock positions were seen, 60 degrees out. Transillumination (Zeiss) was negative. The patient was seen in consultation by Dr. Wilder who recommended electrocoagulation in the area opposite the holes.

With rest in bed the detachment moved to the lower half of the retina, the upper half being replaced. After a week in bed the cautery was used as planned at the 11-o'clock position, 12 mm. from limbus, through a trephined hole, the searing of the choroid being for about one-half second. As the eyeball collapsed on trephining, the cautery was used without trephining at the 2-o'clock position, 12 mm. from the limbus; it took about two seconds for the cautery to sear through the sclera. A spark diathermy was used around each scleral hole in four places.

The result was excellent for the first nine days; then the upper outer quadrant became detached, but no holes were found in the retina. Another operation was performed two weeks after the first operation: two trephined holes were made in the sclera at the 1- and 2-o'clock positions, 14 mm. from the limbus. After evacuation of subretinal fluid the cautery tip was touched to the choroid in the trephined holes. Two weeks later the patient left the hospital, the retina being in perfect position. Two months later redetachment occurred below. No holes were seen in the retina. Vision was reduced to counting fingers at one foot.

At the third operation, two trephined holes were made at the 4- and 8-o'clock positions, 12 mm. from the limbus, and the same procedure carried out as previously. Three and six days later the retina was in place and no complications had developed, but on the fourteenth day it again became loose; still no tears were seen.

A fourth operation was performed, the trephining being at the 7-o'clock position, 13 mm. from the limbus; a spark diathermy of the sclera was carried out in about 20 places nearby without accident. On the fourth day apparently successful healing had begun, but three days later the lower retina again became detached. No further treatment was advised.

Comment. Again, what went wrong? We had excellent immediate results from each operation. After the first operation the result was good for nine days; after the second for two months; after the third for 11 days; after the fourth for six days. Was it possible that we didn't exactly and completely hit and sear all the holes? Was it due to some focus of infection or some general toxemia? Or to secondary cicatricial bands in the vitreous?

Case 4. Mr. R. G. J., aged 49 years, was sent by Dr. Clement to Dr. Wilder for operation for detachment. He was about 7 D. myopic and had worn glasses for 36 years. He had been injured in an automobile accident seven months before, cutting the outer corner of the right upper eyelid, and although he had been seeing some floating spots before his left eye for many weeks, he had only a few days before noticed a considerable increase in those spots. The right vision was 20/30 with glasses; left vision, counting fingers at 6 to 8 feet. The right visual field was slightly contracted concentrically, the left field contracted below almost to the fixation point. Tension was normal. Pupils dilated readily. A large pendulous detachment of the retina was found in the upper temporal quadrant of the left eye. No tears were seen. Transillumination was negative. At operation a trephine hole was made at the 1-o'clock position (upper temporal quadrant), 14 mm. from the limbus and electrocautery tip inserted three times after a large amount of subretinal fluid was evacuated. The patient was quite restless. On the fourth night he sat up in bed and gasped for breath. Three weeks postoperatively the retina seemed to be in place and the patient was sent home to increase his activities slowly. The visual field was full six weeks after the operation but two months postoperatively there was a recurrence of the detachment, this time below. No holes were found. Another operation was performed, with trephining at the 5- and 7-o'clock positions, 12 mm. from the limbus. The procedure was similar to that of the previous operation. Three weeks later the patient left the hospital with an excellent result: The retina was in good position, vision was 20/40. When seen two years later, vision was the same, the media were clear, the retina in excellent position. The choroidal pattern was good and there was minimal reaction to the cautery. I telephoned him last week and he said his eyes were the same. He admitted he no longer rides horseback nor dives, but that he does swim and climb stairs and in nearly every other way has normal activities.

Comment: Was he just fortunate not to have focal infection or sources of toxemia? And was the detachment after the first operation due to his restlessness on the fourth postoperative day? He was certainly an ideal patient at the second operation, and subsequently very cautiously increased his activities. We never did find a hole nor tear, al-

though several of us looked very carefully. The operative technique was scleral trephining followed by cauterization, through the trephined hole, of the choroid and probably of the retina.

Case 5. Mrs. J. J. F., aged 58 years, also a patient of Dr. Wilder, was first seen in February, 1931. Spontaneous detachment of the left retina had occurred one week before. The right vision was 20/20+ with perfect fields; the media and fundus were normal. The patient had been in very good health. Vision in the left eye was counting fingers at one foot, in the upper and temporal fields. The left pupil dilated well. There was a large overhanging detachment covering the optic disc. The top was seen with +12 D. The retina fluttered when the eye moved. Transillumination (Zeiss) was negative. Tension was 13; no tear was seen.

After some rest in bed, no improvement being manifest, a scleral puncture was performed at the 1-o'clock position at the equator (upper outer quadrant); this allowed some subretinal fluid to escape. The following day a tear was seen in the upper nasal quarrant; this was repeatedly localized during the following week and then an ignipuncture was made after a posterior sclerotomy had allowed the evacuation of considerable subretinal fluid. The cautery touched the choroid about 1 disc diameter from the tear. The operation was partly successful, but the upper temporal detachment remained. One week later a sclerectomy was done at the 12:30-o'clock position (a V-shaped flap made and excised, leaving a 3-mm. hole). A large amount of subretinal fluid was again evacuated; there was a slight hemorrhage; a cautery of choroid and retina was done by barely touching them. Evidently, this was unsuccessful and resulted in another retinal hole, as a final cauterization of the sclera with further evacuation of fluid was necessary. This last cauterization did not exactly reach the hole in the retina, but the retina remained flat although somewhat edematous. The edema was marked just above and temporal to the yellow spot. It gradually subsided. In the course of the recovery numerous small, flame-shaped hemorrhages were found in the retina near the areas operated on. The resulting field was contracted below only 15 degrees and vision with glasses was 20/50+. When last seen, over two years after the last operation, the retina was in place throughout.

Comments: 1. A hole in the retina was found only after evacuation of subretinal fluid. It was not perfectly sealed at once by the ignipuncture.

2. One posterior sclerotomy did not cause a retinal tear, apparently—possibly the knife did not touch the retina. One posterior sclerotomy apparently did cause a retinal tear which in part sealed itself, as the cautery tip was not exactly placed so as to include it in the immediate scar. Yet in spite of the imperfect applications the retina eventually became flat.

3. I do not like posterior sclerotomy. I much prefer trephining.

4. If at first you don't succeed, try, try again. Here four operations were necessary, but the result was excellent.

Case 6. Mr. E. T. B., aged 35 years, was first seen in May, 1931. His history was that for four weeks the upper half of objects had been blurred. One month before, he was hit on the left supraorbital region by a foul ball while playing indoor ball. Vision, O.D. (with glasses) +2.75 D. cyl. ax. 90° was 20/20+; O.S. (with glasses) +0.75 D.sph. ⊂⊃ +3.50 D. cyl. ax. 90° was 20/200 eccentrically. (Four years before his vision had been 20/20.)

There was a detachment of almost the entire lower retina. The top was seen with +8 D. The detachment seemed to involve the yellow spot. The tension was normal and transillumination negative. There was a disinsertion at the periphery between the 4- and 5-o'clock positions.

As the patient had several very questionable teeth, I insisted that these be removed before the operation on the eye. When this was done I trephined 10 mm. from the limbus in axis 135 degrees and with electrolysis cauterized the sclera around this in five places, each 1½ mm. from the trephined hole and about equally spaced. Considerable subretinal fluid escaped on trepanation. I examined the eye on the fifth day and

could find no detachment and no retinal hole nor tear. Both eyes were bandaged for two weeks, and the patient was sent home after another two weeks. The visual field was almost entirely normal and vision with glasses 20/30 (three months ago 20/25). The patient gradually increased his activity, and six months later played handball and volleyball again. After the retina had returned to its place, I found an old healed area of choroiditis in a portion remote from the operative area.

Comments: 1. Here we had possible foci of infection removed before operating. An old choroiditis may have been a contributing cause of the detachment. It is known that choroiditis without coincident proliferating retinitis is often associated with a detachment. Is there an etiological relationship? Sometimes there seems to be, but the objective of our operative attack is to produce a chorioretinitis adhesiva; and successful results do often follow.

2. Simple trephining with electrolysis of the sclera to produce discoloration in five surrounding spots and evacuation of the subretinal fluid, were all the treatment this man received aside from bed rest.

Conclusions

From a close study of the records of six cases of detachment of the retina, selected because of their study value alone, I have gleaned the following points which may be of interest to others also.

1. A more thorough study of the general health of the patient should be made, including the heart and blood vessels, genito-urinary system, air passages and lungs, mouth and intestinal tract; and the presence or absence of tuberculosis, syphilis, and so forth, should be determined. More attention must be given to the possibility of postoperative hemorrhage.

2. Occasionally spontaneous reattachment occurs. Therefore, there is no necessity to operate hurriedly. Several days or a week in bed should precede operation. During this time study of both eyes and the other systems may be made and the findings verified. Also treatment should be instituted as indicated by such study.

3. A preliminary operation may be advisable to draw off some of the subretinal fluid so that the holes may be mapped out. This was distinctly advantageous in case five and might have been of benefit in several others.

4. It is advantageous to prevent distortion of the globe by loss of subretinal fluid before the final stages of the operation.

5. Scleral electrolysis with subsequent trephining would be ideal if we could always be sure to reach the choroid. But it is difficult to ascertain just how much choroiditis will be produced, especially if the area one desires to treat is rather posterior. I have, therefore, adopted the Gradle electrode which I use with the Walker diathermy outfit.

6. In order to cause continued postoperative drainage of subretinal fluid until the retina is caught in the adhesive choroiditis produced, it is best to make a large opening which will drain for several days; ordinary posterior sclerotomy will not usually do this, nor will multiple micropunctures of the sclera. It takes longer for a 2-mm. trephined opening than for a minute puncture to heal. Sixty minute punctures will heal about as quickly as one.

7. My best results have been with cases in which we could locate one or more holes or tears or disinsertions and direct our attention specifically to them, although in case four the retina was twice detached, once above and once below; in each case no hole could be found and each time operation was successful.

8. I am inclined to think that too early postoperative examination is bad. I like to wait five to seven days for the first dressing.

9. Edema of the retina is often difficult to differentiate from a flat detachment: the color of the vessels will help. Edema usually disappears spontaneously after some weeks.

There is great value not only to the ophthalmologist but also to the patients, in a close study not only of his successes, but also, and probably more profitably, of his failures.

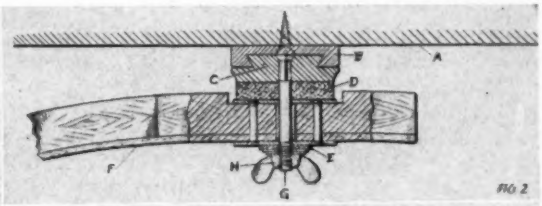
122 South Michigan Avenue.

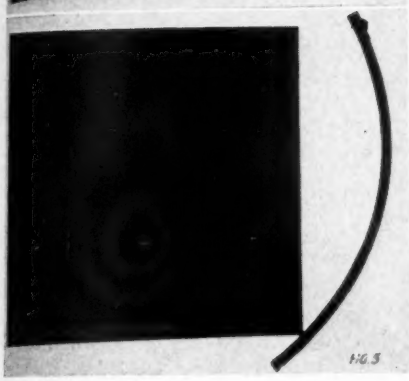
NOTES, CASES, INSTRUMENTS

A ONE-METER PERIMETER*

ALFRED COWAN, M.D.
PHILADELPHIA

The arrangement I am about to describe has been found very useful. In fact, during the past year, I have used it to the exclusion of all other instruments for field studies.





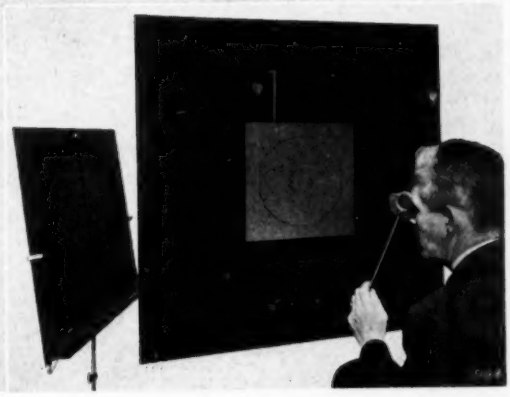


Fig. 1 (Cowan). Screen and perimeter ready for use.

Fig. 2 (Cowan). Details of working parts. A. Tangent screen. B. Wall socket. C. Socket head. D. Rear friction member. E. Front friction member. F. Arm. G. Axis stud. H. Friction regulating nut.

Fig. 3 (Cowan). Perimeter arm detached and hung flat on wall when not in use.

Fig. 4 (Cowan). Method of fixation with plane mirror for plotting central scotoma of left eye.

Briefly, this instrument is a perimetric arc with a radius of one meter describing one fourth of a circle. The arc is removable and when used is attached to the center of a tangent screen 1⅓ meters square. The screen is made of soft linoleum painted black, with radiating and circular lines marked for an angular distance of one meter. The markings are deeply scratched in the linoleum and the whole surface painted a flat black so that, to the patient, it appears to be an almost homogeneous surface. The soft material allows the field to be plotted with small pins, and when it becomes soiled can be repainted without affecting the markings.

The arc is made of light wood composition as shown in the illustration. It is three inches across the face and marked every 10 degrees. The drawing illustrates both the mechanism of the fixed portion (B, fig. 2) which is permanently screwed into the screen on the wall, and the socket head on the arc. The fixed portion does not inter-

*Presented before the Section on Ophthalmology, College of Physicians, February 20, 1936.

fere with the use of the tangent screen when the perimeter arc is removed. A large window toward the north, about six feet from the screen, is the source of illumination. With this arrangement we have the advantage of a working distance of one meter, 90 degrees in any direction in which the arc is turned, and about 30 degrees in every other meridian.

It is not the purpose of this communication to speak of the advantages or disadvantages of a large perimeter; but I should like to state that the same advantages apply to peripheral-field study at greater distances as to central-field study at one or more meters' distance. The real objectionable feature to a large perimeter is the great amount of room it takes—a most logical objection; but, of course, eliminated here by the removability of the arc when not in use (fig. 3).

For the study of central scotomata I use, for fixation with the good eye, the small mirror on a handle (fig. 4); a modification and simplification of the method described by Marcove and me in the American Journal of Ophthalmology, August, 1929.

1930 Chestnut Street.

A TECHNIQUE FOR INTRACAPSULAR EXTRACTION OF CATARACT

DANIEL B. KIRBY, M.D.
NEW YORK

The following points have been used to advantage and with success by the author and have been taught to others. The usual preparations are made. All the possible safeguards, such as retrobulbar injection, akinesis, external canthotomy where necessary, wound sutures, etc., are used.

There are two particular points of interest in the technique. First, an attempt is made to rupture the lower semicircle of the zonular fibers by applying carefully graduated pressure with the point of the lens hook just within the corneal ring before the forceps are applied to the lens capsule. It is, of course, realized that this is essentially the first step in the Smith technique; also that, in the Knapp method, the forceps are removed as soon as this rupture below has been accomplished. With the present method, the forceps are applied directly after the stage of rupture below and are used to guide the lens out, the vis a tergo being furnished with the lens hook. The relaxation of the capsule permits of an easy grasp. Second, a suture which has been placed in the superior sclero-corneal margin is used by the assistant under the operator's direction to elevate the corneal flap and thus afford a view of the upper third of the lens capsule while the forceps are being applied. The lens may be tumbled by applying the forceps below. This suture controls the flap easily, does no harm to the cornea, and is used in the end stage of the operation to reinforce the closure of the wound.

So far, the technique has offered greater success and less hazard in the hands of the author than any other method tried.

780 Park Avenue.

UNUSUAL CATARACT COMPLICATION FORTY YEARS AFTER OPERATION

VIRGIL J. SCHWARTZ, M.D.
MINNEAPOLIS

Mr. G. F., aged 48 years, was born in England with bilateral congenital cataracts. These were needled at Moorfield's Eye Hospital in London when he was less than 10 years old. Infection developed in the right eye, and this had to be enucleated. The left eye, however, made an uneventful recovery, and with appropriate glasses he has lived a useful life, despite the fact that he has had multiple sarcomata, requiring amputation of the left leg and arm. I have tested his refraction from time to time, the last such occasion having been on April 3, 1934. At that time with a lens his vision was 20/25.

On March 15, 1935, he presented himself with the history that about three weeks previously the vision in his left eye had become suddenly very poor. A crescentic gray membrane, evidently a

piece of capsule which had become loosened, hung into the anterior chamber through the pupil. The lower and anterior end was free, while the other end was still attached posteriorly, doubtless to the zonule at the temporal

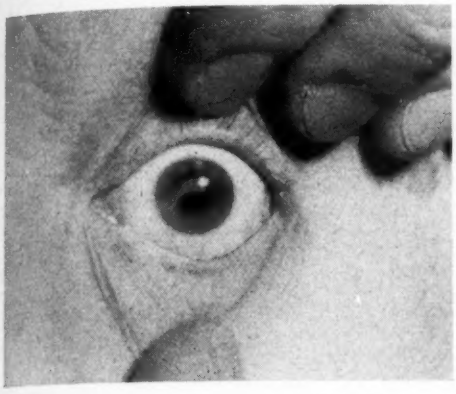


Fig. 1 (Schwartz). The pupil has been partly dilated with homatropine. Prolapsed crescentic membrane can be readily seen.

side. When the pupil was normally contracted the membrane practically occluded it. Fortunately, however, the membrane was translucent, though not transparent, so that the patient could get about. When the pupil was a little dilated, as with homatropine, he was able to see below the membrane, and could even read for a short time. In this condition his visual acuity was 20/30.

Inasmuch as there is marked iridodonesis it is quite possible that there may be a fluid vitreous. The question, therefore, as to the advisability of operative interference arises. It would seem not difficult to open the anterior chamber and insert a pair of iris forceps, or some other suitable instrument, and so withdraw the membrane. However, since this is an only eye, and the patient can see to do his work reasonably well, it is probably best to leave it alone, particularly since the use of 1- or 2-percent homatropine once a day gives him satisfactory vision.

The length of time which has elapsed since operation, and the peculiar nature of the complication make this case somewhat out of the ordinary.

617 Medical Arts Building.

EPIDEMIC KERATOCONJUNCTIVITIS DIVERSIFORMIS

H. G. Merrill, M.D.
SAN DIEGO, CALIFORNIA

For the past two years I have been seeing with increasing frequency a puzzling condition which I have thought to be follicular conjunctivitis in the epidemic form. Recently Col. Robert E. Wright, of Madras, India, lectured at Los Angeles, and this condition now widely epidemic in the western part of the United States was found to coincide very closely with an epidemic of a disease Colonel Wright chooses to call "epidemic keratoconjunctivitis diversiformis," which raged in India between 1928 and 1934, reaching its peak in October, 1932. The clinic over which Colonel Wright presides took care of over 12,000 cases during this time. In my ordinary practice I am seeing from one to eight cases almost every day. The numbers have slightly increased for the past two years.

The signs are much more prominent than the symptoms, which, in fact, are almost absent. It is mildly contagious, occasionally several members of one family having it, but sometimes only one member. The first sign is a slight redness in one eye. In its usual form it is best recognized by beadlike rows of follicles limited to the conjunctiva of the lower lid and most pronounced near its temporal end. While most of the cases would not be recognized either by the patient or anyone observing him, it sometimes, during an exacerbation, appears like acute trachoma of the most violent form. There is little or no discharge. Sometimes there is edema of the bulbar conjunctiva, the lids in severe cases being extremely swollen and sometimes having small ulcers along their margins. The cornea in many of the cases remains normal in appearance but a slitlamp study in some of the cases reveals small curdlike opacities, which are often very superficial but which may be so deep that the endothelium seems involved. These opacities increase in size but clear in the center so that a series of ringlike or semilunar opacities are observed. The condition takes from

Fig. 1 (Merrill). Follicles in lower cul-de-sac.

Fig. 2 (Merrill). Edema of bulbar conjunctiva.

three to 18 months, in a few cases even longer, to disappear.

Bacteriological studies have been negative. Colonel Wright says that Herbert described a bipolar organism as the cause, in 1901, but that no one has confirmed his work. The disease has been successfully inoculated from one human eye to another but in white rabbits inoculation was not successful. The incubation period is said to be from one to four weeks. The cases in India often showed enlargement of preauricular lymph nodes but I have not observed this here until recently, when two patients showed unilateral enlargement on the affected side with acute exacerbation of eye signs.

My cases have come from several states of the West, especially from Idaho, Utah, Nevada, and California, but I have had two cases from Canada. If school physicians would evert the lower lids of the school children I am quite sure they could pick out numerous cases in those attending our schools now.

The corneal opacities spoken of usually do not stain but a few will stain and the epithelium taken from the eye for section often shows inclusion bodies like Negri bodies. The corneal sensibility is normal. There is no fever but often a mild, hardly recognizable, quiet iritis. Eventually the vision is not affected. As mentioned before, many patients have exacerbations which are sometimes very troublesome. In the cases in which the cornea escapes it is frequently impossible to differentiate the condition from follicular conjunctivitis. The conjunctiva of the upper lid, however, is not usually involved.

As to the treatments that I have tried, adrenaline chloride with boric acid and weak zinc solution together with silver nitrate along the edges of the lid in the very severe cases seem to be as good as, or better than, anything else. Perhaps the one needed warning is not to subject these eyes to severe treatment as they all eventually get well anyway. In the earlier cases that I have seen the conjunctival signs greatly overshadowed the corneal signs. The fact that the condition is so devoid of discomfort even when rather severe accounts no doubt for the little attention given to the epidemic, which has already reached an unbelievable magnitude. So far as I am aware this is the first epidemic of its kind to appear in the United States. Europe and Asia have had numerous epidemics and several times this entity has been described as a "new disease." It is to be hoped that this preliminary report will stimulate further investigation.

3245 Fourth Avenue.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

January 10, 1936

Dr. George E. McGeary, presiding

Tularemia

Dr. M. C. Pfunder (Minneapolis) read his inaugural thesis on this subject. He said that in 1911, McCoy and Chapin described the Bacterium tularense as the cause of a plaguelike disease of rodents. In 1912, Chapin found that his own blood, following a febrile attack, caused agglutination of Bacterium tularense.

Tularemia occurs in nature as a fatal bacteremia of rodents, transmissible to man by blood-sucking insects or by inoculation into the skin of infectious material from infected rodents. It has been called deer-fly fever, rabbit fever, glandular type of tick fever, and O'Hara's disease. It was first reported clinically by Pearse in 1910 as deer-fly fever; and in 1919 Francis found the deer-fly to be a transmitter of the infection. In 1914 Vail reported a case of Bacillus tularense infection of the eye; and in 1915 and 1917 Sattler and Lamb reported two cases of "Conjunctivitis tularensis" and traced these to infection from wild rabbits. In 1922 Francis reported his studies in a paper entitled "Tularemia, a new disease of man."

Tularemia occurs in man in six clinical types. These are the ulceroglandular, the oculo-glandular, the glandular, the typhoid, the meningitic, and the pneumonic types. The ulceroglandular is the most common. The symptoms are high temperature and regional adenopathy adjacent to a punched-out ulcer at the site of inoculation. The oculo-glandular cases present the same clinical picture with the primary sore in the conjunctiva. The glandular type differs from the first two types in that there is no demonstrable primary lesion. The typhoid type presents the clinical picture of typhoid fever and is distinguishable from it only by serological tests. In the pneumonic and meningitic types, the symptoms of meningitis and pneumonia intervene during an attack of the typhoid type.

Pathologically, the primary lesion is a subacute infective granuloma. The regional lymph nodes present foci of caseous necrosis at the periphery of which there is a zone of epithelioid and fibroblastic granulation tissue containing giant cells of the Langhans type.

Bacterium tularense, ordinarily a short rod, assumes coccoid morphology in the old cultures. It is a strict aerobe, growing only on culture media containing cystin. In infected human subjects it is found in the blood stream, between the third and twelfth day of the disease. During the second week of the disease, agglutinins appear in the blood, reaching their maximum concentration in four to seven weeks. One attack confers permanent immunity. Frequently cross-agglutination of Bacterium abortus and Bacterium melitensis occurs, and in these cases the diagnosis is established by the proportionately higher titer of antitularense agglutinins.

The treatment of tularemia is symptomatic. Incision of the primary lesions is unwise. Foshay has recently produced a serum from goats and horses which he has used extensively with apparently good result, and which reduces the duration of the disease by one half.

The reaction of fear

Dr. C. J. Plonske (Faribault) read his inaugural thesis on this subject.

W. E. Camp,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

February 18, 1936

Dr. William A. Boyce, president

When to probe congenital occlusion of the lacrimal duct (round-table discussion)

Dr. G. P. Landegger opened the discussion by stating that it was his prac-

tice to enter the duct with the largest probe available and that one or two treatments were generally sufficient. If this was not successful and infection was present he made an incision over the sac and cauterized it with trichloracetic acid.

Dr. H. P. Merrill of San Diego said that he treated such conditions first by medication and pressure and after the child was six months of age by probing, if necessary.

Dr. M. N. Beigelman pointed out that the lacrimal duct in a baby has a slightly different direction from that of the adult. The duct runs directly downward in the infant.

Dr. Harry S. Gradle of Chicago called attention to the etiology of stenosis, that it is due to failure of union of the invaginating upper and lower epithelial sacs and that at times the entire obstruction is due to accumulation of epithelial cells in which there is no infection whatever. When probing is necessary this is done in his office without a general anesthetic.

Dr. M. E. Trainor stated that he prescribes a solution of zinc and adrenalin first, which frequently clears up the situation.

Dr. W. A. Boyce stated that he always probes through the upper punctum.

Dr. E. R. Lewis cautioned against slitting the canaliculus, for it interferes with the physiology of the lacrimal mechanism.

Dr. E. C. Jeancon advised probing after the infant is two to three months of age.

It was also stated by one of the members that a roentgenograph of the chest to eliminate persistent thymus should be made whenever a general anesthetic is anticipated in these cases.

Surgery of retinal detachment; the end results of various methods

Dr. Harry S. Gradle of Chicago (by invitation) presented a review of his six or seven years' experience in the surgical treatment of retinal detachment which was published in this Journal (October, 1936).

Discussion. Dr. Clifford Walker, in discussing the paper, outlined his micropin-puncture method by which the galvanic current is used, and stated that 60 percent of cures could be obtained with galvanism in the first operation. At a second and third operation this percentage could be increased by 90 percent. Dr. Walker explained the mode of action of the galvanic current in producing a dissociation of ions and the production of minute amounts of potassium hydroxide about the micropin. He uses a short curved pin with which there is less danger of puncturing the retina on account of the curved direction in which it enters the sclera, and which produces a greater adhesive choroiditis.

Dr. Gradle, in answering Dr. Eugene Lewis, stated that he had seen two cases of spontaneous recovery. He further stated, regarding the relation of a minor injury to retinal detachment, that this was possible in the presence of strong contributing factors such as high myopia and choroidal lesions.

Harold F. Whalman,
Recorder.

ROYAL SOCIETY OF MEDICINE, LONDON

Section of Ophthalmology

February 14, 1936

Mr. Ransom Pickard, president

Vitamins in ophthalmology

Mr. John Foster said that vitamin A is variously described as affecting growth, epithelial structure, and as a general anti-infective agent. The claims as a general anti-infective agent are, he thought, exaggerated, as the infections associated with deficiency in its intake are of a special type, due to structural breakdown in membranes, without change in the general immunity. The specific effect of this vitamin is on the epithelium of the body (both mucous and squamous) without, however, excluding its effect on the nerve cells. Deficiency of the vitamin causes excessive keratinization, followed by local infection. Its source is "green things of the

land and sea," and in animals it is concentrated in the liver and retina. It is found in most animal fats, including cod-liver oil, butter, milk, and eggs, but is not present in lard. The main storage place of the vitamin is the liver.

A study showed that 16 percent of the population of the Netherlands have a subnormal vitamin-A reserve, and T. Moore got a similar result from tests in England. An extract of retinal tissue has an effect similar to that of carotene (a form of "A" vitamin) in maintaining growth and preventing xerophthalmia in rats deprived of vitamin A. In England hypovitaminosis is more common than frank vitamin-A deficiency, the latter being very rare. A minor deficiency affects the eyes of man and rats by producing hemeralopia. In rats this has been shown to be due to poor regeneration of the visual purple after exposure to strong light. This stimulus breaks down the visual purple into vitamin A and visual yellow. A more marked deficiency causes xerophthalmia. In the rat the corneal surface is bright, oily, and covered with fatlike plaques, or it may ulcerate, whereas with vitamin-G deficiency most of the pathological changes in the cornea are situated in the anterior-stroma layers, and ulceration does not occur. In the rat cataract does not occur as a result of vitamin-A deficiency. In man the condition of xerophthalmia is not dissimilar. Pillat has described many cases which he examined in China and the following three stages he called "prexerosis": slight loss of corneal luster, reduced sensibility, increase of xerosis bacilli with desquamation of epithelial cells. Xerosis proper is characterized by Bitot's spots, pigmentation and wrinkling of the conjunctiva, and keratomalacia.

With regard to the therapeutic use of vitamin A, Knypers has suggested that infantile eczema might be the result of vitamin-A deficiency, and that disease is often associated with phlyctenules. Vitamin A has been used in treating a number of eye conditions by Yudkin and his associate. They treated nine cases of toxic amblyopia, two cases of retinitis pigmentosa, five new cases of phlyctenules, and three old cases with acute exacerbation. The amblyopia patients were given cod-liver oil three times a day, and 4,000 U.S.P. of vitamin-A concentrate intramuscularly twice a week. Four of them recovered from a vision of 1/10 to 1/4 within three months. The other five were still under treatment when the report was made and were improving.

Turning to vitamin B, the whole of this complex is found in fresh yeast, liver, milk, and to some extent in fruit. B2 (vitamin G) has been described as the heat-stabile pellagra preventive, and (in rats) the antidermatitic vitamin. Its absence causes pellagra. Rats fed on a diet deficient in vitamin B showed: (1) muco-purulent exudates in the skin surface of the lids; (2) anterior interstitial keratitis, resulting in normal epithelium, and vascularization beneath it in the cornea; (3) proliferation of lens epithelium, and the breaking down of the fibers directly beneath the capsule. In some cases Morgagni's globules were added to this, and the lens was converted into an amorphous mass.

With regard to the therapeutic use of vitamin B in rats, in the case of six rats when cataract first appeared yeast was given, but the vascularized corneal nebula and cataracts remained, although the general condition rapidly returned to normal. One rat which developed unilateral cataract was immediately given vitamin G, and thereafter there were no further lens changes.

As to the use of vitamin G for human beings, nothing convincing has been found in its experimental administration, nor any suggestion that cataract occurs as a part of the syndrome of pellagra.

Vitamin C (the antiscorbutic vitamin) is found in lemons, potatoes, and most fresh foods, such as meat and milk, but both pasteurization and boiling spoils it. In the body it is concentrated in the suprarenal gland. Deficiency of this vitamin causes disease in the tooth pulp, also generalized hemorrhages. An appreciable amount of this vitamin can be detected in the lens and aqueous humor: in the cataractous

lens the amount is less than in the normal lens. A note from South Africa states that dislocated lenses, which are difficult to dissolve, dissolve more rapidly if fruit juice is administered.

With regard to the antirachitic vitamin D, this is found in cod-liver oil, but no common food stuff is rich in it. It has now been synthesized as irradiated ergosterol: of this it is easy to give an overdose. It is said to assist calcification, and so its administration might hasten arteriosclerosis: still, elderly patients have been given it over long periods without particular change in this respect. The deficiency effect on the eyes is indirect. The association of lamellar cataract with rickets, tetanic convulsions, and malformation of the teeth is well known. Its excessive administration to children who were taking sun baths at the same time has caused follicular conjunctivitis, this latter disappearing when the drug was withdrawn.

Vitamin E is known as the antisterility vitamin, and is found in green stuff, and in higher concentration in its usual source, namely, wheat-germ oil, which, however, does not contain vitamin C.

Finally, with regard to avoleum and phlyctenular keratitis, owing to the liability of phlyctenular keratitis to relapse in a varied degree of severity, the speaker decided to compare cases dealt with in the first three months of last year with those in the first three months of this year. Particulars were given of six of them. The first was an old case in a three-year-old, who attended during the whole of the year 1934, without benefit. Upon using avoleum, recovery ensued in seven months. The second patient was 11 years of age, and had multiple phlyctenules on the right limbus, cured in four months. The third, aged three years, had a central corneal ulceration. The child would not take cod-liver oil. Improvement set in immediately upon its being given avoleum. Recovery ensued in two months, but when the administration of the avoleum was stopped an attack occurred in the other eye. Treatment is still being continued. The condition of the fourth patient, aged five years, was very poor: there was a very bad left cornea. Slight improvement had occurred while avoleum was used. The patient is still under treatment. The condition in the fifth case was also poor: there was a phlyctenule on the limbus in the 6-o'clock position. After a fortnight's treatment the ulcer was healed, and two months later still remained healed. The last patient, aged 12 years, had a phlyctenule on the left limbus, moderately severe. Recovery ensued in 21 days.

Discussion. Mr. A. C. Hudson said that he gives vitamin D in cases of myopia. His impression for a long time has been that it is good to give that vitamin for this condition.

Mr. Lindsay Rea said that for a long time he had been giving to his myopic patients milk, calcium, and vitamin D. In a school of 400 children, all living under the same conditions, there were a number who had myopia, between the ages of 12 and 15 years. One of these in particular would not drink milk at all but in the summer ate a good quantity of ice cream. While she took no milk she was adding to her myopia at the rate of .50 D. every six months. The worst case of keratomalacia he had seen was in an Indian student, who, in the first part of his residence in England, kept strictly to the kind of food he had been having in India: he was physically a miserable specimen. His corneae were wrinkled, and around the margin was vascularization. After he had been prevailed upon to take a diet suitable to the English climate, the corneae recovered completely.

Allergic tests in external eye conditions

Mr. Arnold Sorsby and Miss L. R. Henham said that the question of allergy in man is bound up closely with the advances in the science of bacteriology. The introduction of vaccines led to the discovery that increasing doses of organisms could be tolerated by human beings if the increase were properly regulated. There is also, in the

human being, an increasing intolerance of hypersensitiveness to the introduction of foreign protein into the system. When a foreign protein is introduced into the body there might be (1) no effect, or (2) immunity might be induced, or (3) a hypersensitiveness or anaphylaxis might occur. In some individuals allergy is an inborn tendency, in others it was an acquired condition. Many believe that immunity is something in opposition to hypersensitiveness, but it is not so: a person may be hypersensitive to some substance and at the same time immune to others. If the body is sensitized to a foreign protein, the eye takes part in the responding sensitization, and the inflammatory reaction in the eye can be explained as part of the response of the body to proteins of nonbacterial origin. Very rarely can spirochaetes be found in the cornea. The course of interstitial keratitis is different from that following the experimental introduction of spirochaetes into the cornea. The treatment of syphilis does not give the same results in interstitial keratitis as it does in other syphilitic affections. A physician had episcleritis, the cause of which was unknown. He was sensitive to pollens, feathers, and so forth. He followed a diet which was free from food substances to which he was sensitive, and he became free from his episcleritis.

There is little material available on which it is possible to build up a case in favor of an influence being exerted by allergy in eye conditions. Many suggestions have been made which are attractive, but they lack experimental and clinical support. One suggestion was that keratitis is a result of sensitization of the cornea by the débris thrown out in the course of ulceration, the broken-down tissue acting as a foreign body, and sensitizing the cornea. Many efforts have been made to prove that cataract is an allergic condition, that is, that cataract is allergic to lens protein itself, but the data on which the suggestion was advanced were unreliable.

If cattle are inoculated with cowpox vaccine and the cornea is vaccinated, a sloughing ulcerative keratitis is produced, but it is not so severe as in the control animals which have not been previously vaccinated.

It seems that there is a possible scope for ocular allergy in trachomatous keratitis, interstitial keratitis, cataract, and sympathetic ophthalmia.

At the White Oak Hospital, Swanley, 292 cases were tested with regard to their protein sensitivity; these consisted of 60 cases of phlyctenular ophthalmia, 67 of conjunctivitis, 48 of trachoma, 81 of blepharitis, and 36 of interstitial keratitis. In all the 292 cases there was only one positive result.

With regard to proteose treatment, the problem surrounding this is still unsettled. H. W. Barber (dermatologist) has said that it is unnecessary in an allergic patient to find out what the particular substance is to which he is sensitive, for the patient produces his own antibodies, and they are excreted in the urine. If what Barber said is true, it represents an advance. Martin and Mills published a paper reporting 46 cases of eye conditions which they had treated with proteose, these conditions ranging from uveitis and extensive vitreous infiltration to a chronic panophthalmitis, and all the 46 did extremely well. This paper, which was read before the American Medical Association, was severely criticized, as no evidence was submitted in proof that the patients were really allergic.

Discussion. Mr. F. T. Ridley said he was sorry no allusion had been made in the paper to the recent work of Julianelle on this subject. It was shown that the application to the eye of protein without first scarifying the eye gave only negative results. It had been shown that by injecting the cornea for some weeks with a foreign protein, such as egg-white, or the protein of the pneumococcus, one could sensitize it to that protein: and if one kept provoking allergic response in that way, one produced a pannus and a revascularization on that keratitis like the vascularization seen in clinical ophthalmology.

(Reported by H. Dickinson.)

CHICAGO OPHTHALMOLOGICAL SOCIETY

February 17, 1936

Dr. Robert Blue, president

Hemophthalmus after contusion

Dr. Bertha Klien presented a boy 14 years of age, who sustained a contusion of the left eye one year ago. At that time the left vision was 8/200. There was hyphemia and a traumatic iris sphincter paralysis, but the fundus appeared normal. During the following 10 days a hemophthalmus developed and vision decreased to light perception and faulty projection. The intraocular tension rose temporarily to 46.0 mm. Hg (Schiötz) and an iridocyclitis developed. After two weeks a fresh vitreous hemorrhage occurred. The eye was extremely painful for two weeks. The left vision then began to improve. The patient was kept quiet, sodium iodide was given internally, and local treatment of atropine and heat. At present the corrected vision is 0.5 plus 2, and J. 1. There still remains a slight distortion of the pupil, and a moderate amount of fine and coarse vitreous floaters. A hemophthalmus in young people, despite loss of light perception, has usually a good prognosis, as the absorption of the hemorrhage may be very rapid. Meller has shown that aside from the perivascular lymph spaces of the retina it is mainly the unpigmented epithelium of the flat portion of the ciliary body that aids the rapid absorption of vitreous hemorrhages.

Old contusion

Dr. Bertha Klien said that this boy, 18 years of age, had suffered a contusion of the left eye 10 years ago, followed by progressive loss of vision. Corrected vision is now 8/200. Externally the left eye is normal. The left fundus presents two kinds of lesions: (1) ill-defined, gray streaks which extend from the region of the posterior pole toward the periphery and are located underneath the retina; (2) streaks and groups composed of very small, in places dustlike, rather well-defined, yellowish white flecks, which lie also underneath the retina or in its most posterior layers, as seen with the Gullstrand ophthalmoscope. Each of these areas is at one point at least in contact with one of the gray streaks. There is no gross choroidal rupture. The gray streaks, having a radial and not a concentric direction, cannot be connected directly with a rupture, but a choroidal hemorrhage perhaps of a more diffuse character at the time of the injury is probable, leaving the deep gray lines of organized material between choroid and retina. Also a reattachment of a retinal detachment could be considered, as this may leave similar gray lines. The interpretation of the yellowish flecks is more difficult. They probably consist of fatty granular cells derived from the pigment epithelium and deposited in small and large groups along the inner surface, and in the outer layers of the retina.

Results of orthoptic training

Dr. J. L. Bressler presented two cases. A woman, aged 51 years, was first seen in February, 1934, with a history of the eyes' turning in since her fourth year of age. She had worn glasses for two years, and for the past year had had orthoptic treatment. Upon examination it was found that she had an alternating esotropia measuring, with glasses, 26 degrees, and without glasses, 35 degrees. The vision was 20/25 in each eye. Fixation and motility were good; fusion absent. Orthoptic treatment was tried for several weeks, but the eyes showed a tendency to get worse, the angle at times becoming as high as 45 degrees. On April 27, 1934, a recession of the internal rectus of the left eye was performed, with Reese resection of the external rectus. On May 21st, the remaining deviation varied from 4 degrees to 20 degrees (with glasses). About two weeks later orthoptic treatment was started, and on August 27th, the eyes were parallel with and without glasses. Fusion of all grades including stereopsis is now present. Vision with glasses is 20/15 in each eye.

The second case, in a 28-year-old woman, was admitted to the orthoptic

clinic with a history of the eyes turning in since her fourth year of age. She had had no treatment and had never worn glasses. An alternating esotropia of 30 degrees was found. Vision was O.D. 20/30, O.S. 20/25. Motility and fixation were good. Orthoptic treatment was given from February 11, 1935, until March 29th, without improvement, at which time recession of the internal rectus with resection of the external rectus was performed. On April 17th, the eyes were parallel and orthoptic treatment was resumed. By April 29th, simple fusion had been developed. Now all grades of fusion with stereopsis and parallelism are present.

Anophthalmia

Dr. Carl Apple in showing this patient, said that anophthalmia is an aberration in development, the failure of the primary optic vesicles to bud out. The abnormality is encountered in healthy, well-formed children; not uncommonly in association with other malformations such as harelip and supernumerary digits. The lids, though small, are usually well formed; they may be adherent to their margins. The orbit is smaller than normal, and lined throughout with conjunctiva. Digital examination reveals a small, hard, mobile nodule near the extreme apex. The lacrimal puncta may be absent in one or both lids, but the lacrimal gland is usually present. In these cases the optic nerve has never been found to enter the orbit; it either ends as a cone or fibrous filament at the optic foramen, or it is entirely absent, together with the chiasm. The olfactory lobes and cerebral hemispheres have also been found deficient, which is of interest in that they, like the primary optic vesicles, are outgrowths of the anterior cerebral vesicles. It is the failure of the primary optic vesicles to bud off from the anterior cerebral vesicle which seems to be the usual cause of anophthalmia. Microscopic examination of the nodules found in the orbit has shown them to be composed of subsidiary parts of the eye, of mesoblastic origin. A capsule of fibrous tissue like the sclerotic contains choroidal tissue, but no retina. There is complete absence of the essential nervous elements constituting the eye. The presence or absence of the essential nervous element in the nodule in the orbit can be determined with certainty only by microscopic examination, so that clinically it becomes very difficult to distinguish between true anophthalmia and very high degrees of microphthalmia.

Comments on orthoptic treatment in strabismus

Dr. J. S. Bressler read a paper on this subject, published in this number of the Journal.

Discussion. Dr. George Guibor said that Dr. Bressler had emphasized the salient point on orthoptic training when he said, "One may ask why we should bother with the tedious and time-consuming course of orthoptic treatment when the same results can be more quickly obtained by surgery." He had replied that the same results cannot be obtained by surgery alone as can be obtained by orthoptics and believes that amblyopia and stereoscopic ability are not improved by surgery. Yet if one operates upon patients with little fusion ability and reëxamines these patients after the squint is eliminated, he will find some with stereoscopic vision that has developed over a period of a few weeks or months. There are therefore exceptions to this rule. Another important point which Dr. Bressler emphasized is that all cases cannot be improved by orthoptic training. A second point not mentioned in the paper is that all cases cannot be corrected easily by surgery, and that there are definite indications for orthoptic training. One must have a definite classification of strabismus in mind in order to differentiate surgical from nonsurgical cases. Such a classification must embody the causes of the strabismus and those associating factors that must be eliminated to produce a recovery from the deviation and from the loss of binocular vision.

Dr. Thomas D. Allen said that for the past year he had used the rotoscope on occasion both for diagnosis and treatment. In speaking of the use of any

instrument one must bear in mind that the after effects of its use may or may not be due to the instrument. Especially is this true when it is used seldom. It would be scientific to use it only after thorough examination and diagnosis; and if the condition were found to be rather constant over a reasonable period of time, such as two years, then one might draw conclusions. However, the results might have occurred without the use of the instrument. Also, it is conceivable that the instrument might be used in such a way as to aggravate the condition, and yet the condition become more normal.

The instrument as used, about once a week for 20 to 30 minutes, does not appear to aid greatly in reducing the actual muscle imbalance. In some cases a hyperphoria of several degrees seems to be reduced. One woman, 31 years of age, had been wearing for two years a small cylinder with 2 degrees prism base down in the left eye, and before that had worn 1.5 degrees prism base in and 1.5 degrees base down. The refraction needed practically no change. There was 3.5 degrees of exophoria for distance, and from 3 to 3.5 degrees of left hyperphoria; for near, 13 degrees of exophoria and 4 degrees of left hyperphoria, due to a weakness of the left inferior rectus. Practically no change was made in the glasses and she was quite comfortable for over two years. Then there was a slight change in the astigmatic axis. The muscle balance was about as before except a slight increase in the exophoria (7 degrees for distance and 15 degrees for near). She agreed to try using the rotoscope and as a result her hyperphoria seems now to be only 1 to 1.5 degrees, and the exophoria seems to be somewhat less.

Another case, a nine-year-old girl, had a divergent squint when first seen with high-grade mixed astigmatism and vision of 20/50 in each eye, divergence of 20 to 25 degrees of arc, either eye fixed, and no fusion. Four months later there was no improvement and orthoptic treatment was unsuccessful. Three years after the first visit there was divergence of 30 degrees of arc, no gross change in refraction, and very slight improvement in vision. On December 27, 1935, resection and advancement of the right internal rectus was performed, with subconjunctival tenotomy of all main fibers of the externus. There was questionable overcorrection at the time of operation. At the first dressing the eyes were straight, but within a few days slight divergence under cover developed. The rotoscope was used almost daily from the fifth postoperative day. After two weeks there was 25 percent fusion on the Keystone charts. Since that time the patient has used the rotoscope, at first twice a week, more recently once a week. She still has excellent fusion, excellent convergence and divergence, but under cover the eye still diverges some 10 degrees of arc.

He had yet to see a single case in which operation was certainly avoided by the use of this instrument.

Dr. W. F. Moncreiff asked why it is, that when orthoptic training is applied routinely in all cases of concomitant convergent squint, in some cases the squint angle remains unchanged, while in others the angle is reduced or even disappears? As a basis for the accurate analysis of this problem, we need a simple but adequate classification of the types of concomitant convergent squint. In the first place, we must rigorously exclude all cases of muscle palsy, whatever their stage. Having done this, we will find that the classification which Worth employed is correct and is preferable to more complicated, but also superficial and artificial classifications more recently proposed.

We see at once that there are two types of situation in which orthoptics is inapplicable or unavailing: (1) the true or essentially alternating squint; (2) the nonalternating squints in which the vision of the amblyopic eye cannot be improved by any feasible therapy beyond 0.2. A third type is found in older children with either accidentally alternating squint or nonalternating squint in which the squinting eye has vision of 0.3 or better, including some neglected cases in which, over a period of years, with a fixed squint angle, secondary anatomic changes amenable only to surgery have occurred in the

muscles. While in this group orthoptics is useless preoperatively, it has a definite place as a postoperative measure, as Dr. Bressler has so well stated. With this latter group of children, however, at early ages, especially within a few months of the onset of the deviation, orthoptic training should be able to achieve its highest percentage of good results.

Dr. J. L. Bressler (closing) said that too much is expected of orthoptics when it is used alone in the treatment of strabismus. It is true that many cases, properly selected, can be corrected, but the greater number will eventually come to surgery. In this group orthoptics will play a very important role, not only in developing fusion or improving vision, but also in completing a cure in many cases of undercorrection and overcorrection, thereby avoiding the necessity for further surgery. While the following statement may call forth some criticism, he could not help feeling that when the attempt is made to correct strabismus with surgery without previous attempts to improve vision and develop fusion, or postoperative orthoptic treatment, the end results in a great number of cases will be cosmetic only. The patient still continues to use only one eye, and suppresses the previously deviating eye, although the operation may have resulted in parallelism.

Robert von der Heydt

COLORADO OPHTHALMOLOGICAL SOCIETY

February 15, 1936

Dr. E. M. Marbourg, presiding

Striate retinal hemorrhages in the papillo-macular region

Dr. Leo L. Davis presented Mr. B. D., aged 60 years, who had noticed poor vision in his right eye three weeks previously. Striate hemorrhages were seen in the papillo-macular region of the right eye, outlining the nerve-fiber layer. There were three round white areas of exudate. The left fundus was normal. There was no abnormal angiosclerosis. Physical examination was negative except for the poor condition of the teeth. Blood pressure was 160 systolic; urinalysis normal.

Discussion. Dr. Edward Jackson mentioned the element of eyestrain as a factor in causing retinal hemorrhages. In this case, the age of the patient suggested vascular disease as the cause, although hemorrhages are often seen in young individuals without any apparent reason.

Dr. E. R. Neeper thought that this was a case of hemorrhage due to focal infection in the teeth.

Dr. W. H. Crisp observed that hemorrhages may occur anywhere in the body at various periods of life and after certain diseases, such as influenza. It is not known whether these are due to changes in the vessel walls or in the blood.

Dr. E. M. Marbourg suggested the use of ophthalmic thyroxin to clear up hemorrhages into the vitreous. He had found marked improvement of vision in cases of disseminated choroiditis following its use.

Blindness in an infant operated on for meningocele

Dr. G. H. Hopkins reported the case of a baby, aged 11 months, who had been operated on for a meningocele. Apparently the child was entirely blind although the puplis reacted normally and the nerve heads appeared normal. There was a refractive error of six to eight diopters of hyperopia. The question was raised as to whether glasses should be prescribed.

Discussion. Dr. Edward Jackson expressed the opinion that there would be no advantage in putting on glasses, since there is a normal decrease in hyperopia of from two to five diopters in the first four to six years of life. The pathology was probably in the occipital lobe.

Edna M. Reynolds,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

EDITORIAL STAFF

LAWRENCE T. POST, Editor
640 S. Kingshighway, Saint Louis

WILLIAM H. CRISP, Consulting Editor
530 Metropolitan Building, Denver

EDWARD JACKSON, Consulting Editor
Republic Building, Denver

HANS BARKAN
Stanford University Hospital, San Francisco

HARRY S. GRADLE
58 East Washington Street, Chicago

H. ROMMEL HILDRETH
824 Metropolitan Building, Saint Louis

PARK LEWIS
454 Franklin Building, Buffalo

C. S. O'BRIEN
The State University of Iowa, College of Medicine, Iowa City

M. URIBE TRONCOSO
350 West 85th Street, New York

JOHN M. WHEELER
635 West One Hundred Sixty-fifth Street, New York

EMMA S. BUSS, Manuscript Editor
4907 Maryland Avenue, Saint Louis

Address original papers, other scientific communications including correspondence, also books for review and reports of society proceedings to **Dr. Lawrence T. Post, 640 S. Kingshighway, Saint Louis.**

Exchange copies of medical journals should be sent to **Dr. William H. Crisp, 530 Metropolitan Building, Denver.**

Subscriptions, applications for single copies, notices of change of address, and communications with reference to advertising should be addressed to the **Manager of Subscriptions and Advertising, 640 S. Kingshighway, Saint Louis.** Copy of advertisements must be sent to the manager by the fifteenth of the month preceding its appearance.

Author's proofs should be corrected and returned within forty-eight hours to the **manuscript editor.** Twenty-five reprints of each article will be supplied to the author without charge. Additional reprints may be obtained from the printer, the George Banta Publishing Company, 450-458 Ahnaip Street, Menasha, Wisconsin, if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

NERVE STRAINS OF VISION

Eye strain was a term brief and suggestive; but it concentrated attention too exclusively on the eyes. This was not bad, so long as the strain of accommodation or convergence, and the pathologic changes thus caused, were the chief departures from health that claimed attention; and the correction of refractive errors by glasses was supposed to be the only needed remedy. But a broader understanding of visual deficiencies and ocular disease justifies a more inclusive term to be applied to them.

Treacher Collins pointed out that macular vision and binocular vision and movements were developed together by our "arboreal ancestors," and are peculiar to man and the most nearly related primates. Prof. Elliot Smith showed that with these developments of human vision came the brain development of the cerebral convolutions, which he calls the neo-pallium, the chief organ of human intelligence. It cannot be supposed that these developments are merely accidental and coincident. The reasonable view is that human vision rendered possible so many new coördinations and applications of the sense of sight that these required the greater mass and elaboration of nerve cells and coördinating fibers, and that a greater mass of nerve centers was thereby necessary.

It is a general law of evolution that organs and structures more recently developed and organized are more liable to variation and defect. They are less perfectly adapted to the new functions they have to perform; and are more liable to give way under the work they have to do, more liable to disease and disability, and likely to become a source of pain, or confusion. The new powers can be a great source of pleasure and achievement; but they can be a source of pain, and are especially liable to defect, or to become unequal to all that might be expected of them.

It was no fancy, or fad, that newly

discovered errors of refraction needed correction by glasses; or that heterophorias, or other defects of binocular movements demanded consideration. Nor was it merely that so large a proportion of the race had suddenly devoted themselves to reading, drawing, fine needlework, and mechanical trades that required prolonged and accurate near vision. All of these things had their share in causing nerve strain. But a more important factor is the exercise of the exact, elaborate coördinations of macular vision with all the other senses, the values and employments of which were enormously increased by coördinations with exact binocular vision. These new functions for the nerve centers are a great contribution to what Sherrington has called "The integrative function of the nervous system." These new structures and functions are not exempt from the presumption, that because they are recent they are more liable to defect; and more likely to be starting points for pain and dysfunction of various kinds.

The disorders of the nervous system, starting in the coördinating mechanism, that brings the greatest benefits from improved and applied binocular vision, have received but slight notice in the literature of ophthalmology. The important coördinations of the central nervous system, created or modified by the development of binocular vision, have been very little studied. It is certain that the symptoms of nerve strain from the use of the eyes depend on other things than over-use of accommodation and convergence. The recent paper of Virgil Wescott (this Journal, 1936, v. 19, p. 385) shows that asthenopia following head injuries is not generally due to either loss of accommodation or paresis of the extraocular muscles.

Old people who have been great readers, who have come to rely on reading for the sole means of recreation, who still have good acuteness of vision, and no serious loss of power in their ocular muscles, will begin to read less and less, or give it up altogether. Under the senile involution of the nervous system they quit reading because it is too hard for them. Without other occupation they sit idly by, waiting for the end. Not only the ocular organ of vision may suffer from over use. The central nervous mechanism, which has been developed for vision, also fails. Any understanding of nerve strain arising from use of the eyes, must take into consideration the strain of the part of the central nervous system actively engaged in the process of coördinating the visual impressions with the impressions of the other senses, and with the motor coordinations which have to do with the use of vision in the general orientation and equilibrium of the whole body.

Edward Jackson.

THE RETICULO-ENDOTHELIAL SYSTEM

For something over twenty years the literature of histology and pathology has contained frequent references to an entity bearing the high-sounding title of "reticulo-endothelial system." The subject has been occasionally mentioned in ophthalmic literature, but usually without extensive discussion or explanation; and it may be conjectured that few ophthalmologists can lay claim to more than a very hazy understanding of the structures and principles involved.

In 1869 Virchow observed that the lymph nodes fixed pigment granules arising from tattooing of the skin; and Cornil demonstrated that the granules were localized in the cells of the reticulum of the nodes.

In 1892 Metchnikoff, in his work on the comparative pathology of inflammation, divided phagocytes into microphages, represented by the polynuclears, and macrophages, fixed and mobile; the former being the large mononuclear cells of the blood, and the latter including the endothelial cells of the lymph nodes and of the sinus of the spleen as well as a number of other connective-tissue cells.

In 1913 Kyono coined the word "histiocyte" to include any cellular element which fixed vital stains; all such elements being of mesenchymatous origin. To these cellular elements, which corresponded to those described by Metch-

nikoff, Aschoff applied the designation "reticulo-endothelial system."

Vital staining is the elective staining of certain anatomic elements, obtained by injection or absorption of coloring matter in a living animal. Langeron has described it as an accumulation of stain in special portions of the cell.

By several authors a relationship has recently been traced between the reticulo-endothelial system and the perversion of bodily defense mechanism which we know as anaphylaxis. In general, it may be remarked that there is a tendency to associate with the reticulo-endothelial system, in a rather vague way, some vices and a number of virtues, including especially the process of defense against such chronic diseases as tuberculosis.

The cells of the reticulo-endothelial system are found throughout the entire organism, but particularly in the connective tissue of the liver, spleen, bone marrow, and adrenals. Beside phagocytosis, these cells have the function of taking up other foreign material, including bacteria and cellular débris. Such activity is increased during infections, and is perhaps in some mysterious fashion reduced or absent in the disease known as agranulocythemia. Isaac and Bieling have credited these cellular elements with playing an important part in the formation of antibodies.

Németh (Klinische Monatsblätter für Augenheilkunde, 1936, v. 96, p. 613) recently presented to the Hungarian Ophthalmological Society a monograph in which he described animal experiments as to the part played by the reticulo-endothelial system in suppurative inflammations of the cornea. He inoculated the corneal tissue of rabbits with bacteria, at first using pure strains of individual bacteria, but later finding mixed infection equally satisfactory. The vital staining was obtained by intravenous injection of a solution of trypan blue.

The histiocytes (by which term Németh understands the mobile members of the system which are found in connective tissue) failed to appear in cases of mild keratitis, but were always present in violent inflammations. An injection of 10 c.c. of a one-percent solution of this stain was sufficient to demonstrate histiocytes twenty-four hours after the injection, but a greater dose of the stain was necessary in order to obtain vital staining of fixed cells and of the endothelium of the inflamed cornea even as late as the eighth or the tenth day of the inflammation.

If the inflammation was sufficiently severe, the migration of the histiocytes into the cornea began in about seventy-two hours and then rapidly increased. On the fourth or fifth day the suppurative inflammation of the cornea began to be surrounded by a blue ring, at first only visible under magnification but later with the naked eye. This was produced by the stain carried by the histiocytes which collected around the infiltrate in large numbers. On the eighth day of the inflammation the histiocytes became visible by means of the slitlamp in the form of finer or coarser granules in the cornea. The number of granules increased noticeably with the beginning of vascularization.

After fifteen or twenty days of inflammation the histiocytes began to predominate, and the leucocytes gradually assumed less importance. Even the reticulo-endothelial cells might ultimately undergo destruction if the task assigned to them was too great.

Németh does not agree with authors who have attributed to the leucocytes the duty of conveying nourishment to the fixed cells during the process of repair after injury. He feels that this function more probably pertains to the histiocytes.

The literature of the reticulo-endothelial system teems in complications, in speculative hypotheses, and in conflicts of opinion. There is inadequate agreement as to which cells are properly to be included. The system has been accused of giving rise to local formation of granulated blood cells, and of serving as a basis for development of lymphocytes. In infectious diseases the reticulo-endothelial cells of the liver and of the abdominal lymph glands are credited with phagocytosis of disfigured erythrocytes. Its cells store iron liberated from disintegrated red blood cells. They

have a great affinity for lipoids. So far it has not been possible to demonstrate that they store and transform proteins. In tuberculosis the attempt of the monocytes to destroy the tubercle bacilli usually fails and it has been suggested that tubercle bacilli live as parasites within the monocytes.

How much of the knowledge which is being accumulated concerning the reticulo-endothelial system will ultimately lead to advance in therapeutic methods? Much has been said of blocking the reticulo-endothelial system by injection of colloidal metals, or by stimulation with roentgen or other radiation, and of measures for decreasing the function of the histiocytes. In such a subject the ophthalmologist is interested chiefly because of his conception of the eye as an integral part of the whole organism. Little by little, investigations like that of Németh add to the accumulated understanding of the processes of local and general resistance and immunity. W. H. Crisp.

THE NEW YORK MEETING OF THE AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

The good judgment of the Council was again proved by the outstanding success of the recent convocation in America's premier city. One would be tempted to use such expansive words as colossal and magnificent had the recent political contest not worn thin all English superlatives.

Though numbers alone are by no means a good criterion of the value of a meeting, such an attendance as the October gathering is astonishing. By Wednesday night, the registration, as announced by the president, was 1711, exceeding by more than 500 the count at any previous session. As the president-elect expressed it, the infant organization of thirty years ago had grown into a giant.

Now that the Society has become so large, the question is what to do with it. As the secretary-treasurer said at the business meeting, we do not want to lose the intimacy of our society by the necessity of housing and carrying on our widely diversified activities under separate roofs. We want to try to avoid auditoriums if possible, but there are few hotels that can accommodate us.

Many cities wanted the 1937 convention, and a choice was difficult because of this and other considerations, such as suitable geographic and climatic localities. After much deliberation, Detroit was selected. Many of our members have kept green the memories of the last meeting there ten years ago. Among the pleasant extracurricular activities were the official excursions on the river and certain less official night sallies across the Detroit River by our more adventurous members.

We shall be led to Detroit by Dr. Lee Wallace Dean who, having ably served his initiation as president-elect, will act as president for the coming year. To succeed him has been chosen a man who has been a guiding spirit, an indefatigable worker, and an originator of many of the best features of the Academy—Dr. Harry Gradle.

It was he who suggested the instructional courses as a part of the program and who has labored long and valiantly as secretary of the ophthalmic section. The instructional element of the Academy has been its unique feature and there is undoubtedly much truth in the remark of a member, overheard in one of the Waldorf elevators, when his companion commented on the vitality of the Academy, "If you want to know the cause, it's the courses."

Another important contribution of our president-elect was the arousing of interest of our former Surgeon General Ireland in establishing coöperation between the Army Medical Museum and the Academy, so that the present mutually satisfactory arrangement was made by which specimens furnished to the Museum are sectioned and studied and report and specimens returned to the senders. From this grew the loan collections of pathologic material which are borrowed for study by our members with increasing frequency. We congratulate Dr. Gradle on his election and the Academy on their fine selection.

As first vice-president of the ophthal-

mic section Dr. Bernard Samuels was chosen. This also was a meritorious choice, for Dr. Samuels has acquired an enviable reputation as chief of the ophthalmological department of Cornell University and as one of our leading ophthalmic pathologists. Under the guidance of these men the next session will be one that our members cannot afford to miss.

We arrived Monday morning in time for the opening gathering, where we listened to excellent addresses by our president, Dr. Frank Burch, and by our honored guest, Sir John Herbert Parsons. To greet later this famous ophthalmologist and courteous gentleman was a never-to-be-forgotten experience. He modestly disavowed the many eulogistic expressions of speakers and toastmasters during his visit but no lauditory comment could have done more than justice to our distinguished visitor.

It is possible to discuss only a few high spots of the meeting in an editorial of reasonable length. We regard the teachers' section as of sufficient importance to be treated in a separate editorial in the next issue. Let us here add another word about the courses. They seem to be continually improving. Probably the natural teachers are being discovered and the type of course that lends itself to an instructional period is being learned. The writer attended six courses, all of which were found to be interesting and instructive. In one the cerebroöphthalmic relationships were portrayed with unusual clarity, beautiful charts and specimens being used for illustration; in another a new operation was clearly and convincingly described; in still another, one of the best lectures we have ever heard on orthoptics was given. In accompaniment there was a complete exhibit of apparatus which was disinterestedly demonstrated by numerous trained technicians. It is this kind of exhibit we should like to have permanently set up in New York or elsewhere. Possibly some such organization as the National Society for the Prevention of Blindness might be interested, for orthoptics has importance in their work and the profession needs unprejudiced demonstrations in trying to evaluate orthoptics. It has been more handicapped than helped by high-powered salesmen who tend to overestimate to the prospective buyer the virtues of the particular instrument that he is trying to sell and fail to point out its limitations. No one instrument can cover the field any more than one camera will fill all photographic needs. Possibly an Academy grant to aid in such a plan for permanent demonstration might be made available.

There is space for only a few more lines and these must be devoted to the banquet, over which our well-loved president, Dr. Frank Burch, presided. Some had feared that the distractions of New York would reduce the attendance on this occasion, but such did not prove to be the case. The large and beautiful hall was filled to capacity, the program was excellent, the banquet delicious. Our charming British guest expressed the feeling of all when he said that the banquet scene spread before him was wonderfully beautiful, but to him—and this was obviously from his heart—most beautiful of all was the conjunction on the platform of the American and British flags.

Lawrence T. Post.

BOOK NOTICES

The eye and its diseases. Edited by Conrad Berens, M.D. Cloth binding, 1274 pages with 436 illustrations, some in colors. 1936. Philadelphia and London, W. B. Saunders Co. Price $12.00.

The following "Foreword" to this volume, probably the last from Dr. Wilmer's pen before his sudden death in March, was rejected by the publishers because of his decease. To Journal readers, however, it will have lost nothing of its significance by the fact that that pen was laid down before the publication of the book.

FOREWORD

Samuel Johnson said: "There are two things which I am confident I can do well; one is an introduction to any liter-

ary work, stating what it is to contain, and how it should be executed in the most perfect manner." Such ability and happy confidence, which are sadly lacking in the writer of this foreword, are really necessary to do justice to this ophthalmologic thesaurus. It contains seventy-three chapters contributed by different authors from other parts of the world, as well as from the United States —which gives it an international character. It thus presents in a concise, practical, and authoritative form the experience gained in the clinics and laboratories of the world. This work is truly encyclopedic; for it covers all phases of ophthalmology from its earliest history to present-day ophthalmologic jurisprudence. In this work are discussed the latest advances in the science and art of ophthalmology—aniseikonia, radiotherapy, ocular bacteriology, avitaminosis, orthoptic training—the latest procedures, and therapeutic measures. In addition, it is well and profusely illustrated.

This modestly called "Eye and its diseases" reflects much credit upon its dynamic editor, Dr. Conrad Berens, and upon his collaborators. They deserve the warmest congratulations. To them, the student and teacher of ophthalmology and practitioner of general medicine owe a great debt of gratitude for giving them this fine cross section of the world's view upon the many fascinating problems of ophthalmology.

As "good wine needs no bush," so a good book needs no eulogy.

William H. Wilmer.

This book has been written by 82 ophthalmologists, most of whom are properly ranked as "international authorities," regarding the subjects on which they have written. It is inscribed "To my first instructors in ophthalmology, George E. de Schweinitz, M.D., and my father Conrad Berens, M.D."

The "Diseases of the eye" by G. E. de Schweinitz has run through ten editions in the last 44 years, keeping its leading position by the careful revisions of its author. The editor and publishers of this new work may reasonably have brought it forward as a worthy successor to the books of de Schweinitz and Fuchs. But it may well attain a wider circulation and influence than any of its predecessors. Specialization has been forced, by the expansion of medical science and medical art; and this goes on more rapidly in each specialty than it ever did before in the general fields of medicine and surgery.

The editor, in his Preface points out: "Because of the development of the science of medicine and the inter-relation of its branches, the scope of ophthalmology has broadened to a degree that has made it necessary for ophthalmologists to specialize in certain clinical or scientific aspects of their work. This has made it impossible for any ophthalmologist to write as authoritatively on all aspects of diseases of the eye as on the limited field to which he has devoted his special interest." This thought underlies the plan of the book, and is displayed in the table of contents, in its division into 14 parts and 73 chapters. Sometimes a single chapter is the work of two or more writers; as chapter 29, by F. A. Williamson-Noble and Arnold Sorsby and Ida Mann of London, and C. H. Usher, of Aberdeen, Scotland.

One chapter is the work of two writers, now gone: William C. Finnoff on "Tuberculosis of the eye," and William Holland Wilmer on "Therapeutic use of tuberculin." This chapter, in four pages, records their important conclusions from many years of experimental and clinical observation.

Chapter 50, on "Movements of the eyeballs and their anomalies," comes from C. D. Verrijp, of Leiden, Holland, Luther C. Peter, of Philadelphia, and W. A. Pugh, of London. It deals with Movements of the eyes, Motor anomalies of the eyes, and Orthoptic training. Part XI deals with the Hygiene of the eyes, including the Prevention of blindness. Part XII is given to Immunology, 12 pages. Part XIII takes up Legal aspects of ophthalmology and Part XIV, Laboratory diagnosis. Each chapter ends with references, which vary in number from a half dozen to one hundred and sixty-two.

A review of this book brings pleasant surprises; as one meets among the con-

tributors the names of Browning, the bacteriologist of Moorfields Hospital, Comberg of Rostock, Lindner of Vienna, McKee and Whitnall of Montreal, Traquair of Edinburgh, Van der Hoeve of Leiden, and Marx of Rotterdam.

This work, rather than as a successor to de Schweinitz, or Fuchs, might be compared to the four-volume "System" of Norris and Oliver, or the three editions of the Graefe-Saemisch Handbuch. A close inspection of it, from the five-page list of contributors to the three-column, 40-page index, leaves outstanding impressions of the enormous extent and swift progress in the development of ophthalmology, and the intelligent, minute, and thorough work of the editor.

Edward Jackson.

Awerbach jubilee volume. Published by the State Publishing Department of Biologic and Medical Literature, Moscow-Leningrad. Cloth binding, 593 pages, 1936. Price not stated.

The Awerbach jubilee volume is a collection of contributions by "pupils, colleagues, and friends," issued in commemoration of forty years of "scientific, pedagogic, and social activity," by Michail Josiphovich Awerbach, editor of Sovietskii Viestnik Ophtalmologii and chief of the Helmholtz Institute of Didactic and Clinical Ophthalmology, which is described as the largest eye hospital in Europe.

Awerbach, the introduction states, is one of the Russian scholars who honestly joined in the building of Russia's new social order. He directed ophthalmologic activities and served in an advisory capacity on practically every committee planning Russia's vast public-health program. His teaching activity began in 1910 as professor of ophthalmology on the faculty of the medical courses for women. At present he is professor of ophthalmology at the Second Moscow Medical Institute. In the Helmholtz Institute he directs the training of thousands of ophthalmologists.

In addition to contributions by a large number of Russian ophthalmologists the volume contains articles by Arruga, Avizonis, Hirschfeld, Sattler, Seefelder, Igersheimer, Morax, Polack, Sourdille, and Meller. An outstanding feature of the volume (as also of Sovietskii Viestnik Ophtalmologii) is the number of articles dealing with the role of ophthalmology in furthering cultural advancement of the masses, and the shifting of the emphasis of ophthalmologic effort from the individual to the group. Brief abstracts of the papers will be found in the abstract department of the American Journal of Ophthalmology.

Ray K. Daily.

Lecciones de Oftalmologia Clinica Especial. By Dr. Manual Marquez. Paper binding, 489 pages, 490 illustrations, some in color. Madrid, S. A. Blass, 1936. Price 40 pesetas.

This is the first fascicle of the special part of Prof. Marquez's textbook on Clinical Ophthalmology, and third of the series he has been publishing. This fascicle includes in its first chapter or "lecture": diseases of the ciliary region, of the lids, palpebral aperture, operations performed on the lids, and blepharoplasty.

In the second chapter are described diseases of the orbita and the semeiology of exophthalmos; in the third, the anatomy and physiology of the oculomotor apparatus and muscle operations; and in the last two chapters, the author deals with lacrimal diseases and their treatment, especially by operations.

The book is very well printed and profusely illustrated and conveys to the reader a great deal of modern and complete information. It is more an encyclopedia than a textbook.

In the chapter on "Disorders of the motility of the eyes," very little credit is given to American authors. Professor Marquez quotes only Peter's work, but mentions at length opinions of English and German authors.

The chapter on "Paralysis of the external muscles" is very well written and shows graphically the function of the muscles and the place of both images

in diplopia. For the diagnosis of the paralyzed muscle the author uses only subjective tests for diplopia; he does not mention the objective or screen test, so much used in this country.

In the chapter on "Operative correction of strabismus," he describes a case of tenotomy of the inferior rectus which he performed with success.

The second and last part of this book will include diseases of the eyeball, ophthalmic neurology, and the relations of ophthalmology and general medicine.

Manuel Uribe-Troncoso

OBITUARY

Claud A. Worth

The death of Claud A. Worth occurred on June 21st at Falmouth, on the south coast of Cornwall, England. He was born and grew up at Holbeach, near the coast of Lincolnshire. He studied medicine at St. Bartholomew's Hospital, London, qualified in 1893, and then studied in Paris. He became a Fellow of the Royal College of Surgeons of England in 1898. He served as Ophthalmic House Surgeon in the Loughborough Hospital near Birmingham, and there showed his understanding and love for children.

In 1898 he returned to London and became head assistant at the Royal London Ophthalmic Hospital. In 1899 he became a member of the Ophthalmological Society of the United Kingdom. Before its meetings he presented most of his important observations. The first of these papers was read on October 18, 1900. Its subject was "Orthoptic treatment of convergent squint in young children." In this paper he described the form of reflecting stereoscope which he called an amblyoscope. It was designed especially to secure simultaneous vision with both eyes. It was modified by others and became the progenitor of several of the widely used instruments of today.

In 1902 appeared Worth's book on "Squint, its causes, pathology and treatment." He emphasized the importance of training the "fusion faculty," which, he believed, reached full development by the seventh year. Fully to "cure" a case of squint—develop full binocular vision—training must begin as soon as squint is noticed; much earlier than had previously been attempted. This book ran through six editions and was translated into several other languages.

In a paper on "The heredity of myopia," Worth told of a family, followed through several generations, in which the males were myopic, but the mothers who transmitted the defect were not. He also described two cases of congenital cystic change in the posterior layer of the iris. A case of this kind has been seen by the writer, but no other mention of the condition has been found in the literature.

Worth also published a book on "Yacht cruising," which has been spoken of "as a classic by yachtsmen who were unaware that he had had other interests in life." "It was a source of great regret to Worth to be obliged, because of ill-health, to give up his ocean-going craft; but to the end he kept a small yacht for coastal cruising." On account of his broken health he gave up practice, removed from London in 1921; and resided in Falmouth. The harbor there is the first refuge for craft that have passed Lands End and the Lizard, escaping from the storm-driven Atlantic.

In America, ophthalmology owes much to Worth, although the muscle advancement operation he devised and improved has been modified and simplified by others. His retirement for fifteen years from active practice has caused him to be less known than he should be to the younger ophthalmologists.

Edward Jackson.

CORRESPONDENCE

The International College of Surgeons

Sept. 10, 1936

Editor,
American Journal of Ophthalmology.

The establishment of Colleges of Surgeons in the principal countries of the world has resulted in a higher standardization of surgery. Not only has it stim-

ulated surgeons to strive for a higher goal, particularly the younger man, but it has also raised the standards of hospitals until it has eliminated a horror against hospitals which was universal for so many years.

It is timely that an International College of Surgeons be formed. The International Surgical Society has been in existence for some years. It is a highly respected organization, limited in membership and, under the able leadership of Dr. Mayer, of Holland, has done good work. But it has made no attempt to broaden its field. The International College of Surgeons, however, with headquarters in Geneva, Switzerland, will open its doors to all reputable surgeons, of all countries, who can pass the severe examination or who, because of outstanding ability, are recognized as of sufficient eminence to be appointed without examination.

Professor Arnold Jirasek, of Czechoslovakia, was recently appointed President. Professor Albert Jentzer, of Geneva, was appointed Secretary-Treasurer General for Europe. We are happy to state that the appointment of Director-General was tendered to Dr. H. Lyons Hunt, of New York City, who for years held the same position with the American Medical Editors' and Authors' Association.

Naturally everyone is interested in knowing who, of the American Surgeons, have already been chosen for Fellowship. For obvious reasons it would be untimely to mention them here. A booklet of their names, addresses, and hospital affiliations has already been prepared.

The number of Regents and appointed Fellows throughout the world is limited to one thousand. In the list of American and Canadian surgeons recently sent out, are the names of a few hundred of the most prominent surgeons on this continent. If the same intelligence is used for all honorary appointments, the College will have a nucleus of the greatest men in surgery in the whole world.

The creation of an organization of this kind was bound to meet with a certain amount of criticism. We are not unmindful that the American College of Surgeons had to combat such criticism in its formative years. The answer —the acceptance of Fellowship by the outstanding surgeons of this country and Canada. The College must stand or fall by showing its need, by having on its roster those men in surgery who have always had the highest ideals and who have the courage and leadership ability to make a success of any undertaking to which they have lent their names. Naturally, the administration of such an organization must be placed in the capable hands of men who have vision, who are unbiased and who will work with an idealism which will make the College respected. We feel that a right start has been made. The future will tell the rest of the story.

Harold Hays, M.D.
133 E. 58th St., New York City.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, history
19. Anatomy, embryology, and comparative ophthalmology

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Groenouw. **Sympathetic ophthalmia resulting from gonorrheal corneal ulcer, observed for nineteen years.** Klin. M. f. Augenh., 1936, v. 96, June, p. 742.

The right eye of a man of 43 years became affected with sympathetic ophthalmia two months after perforation of a gonorrheal ulcer of the left cornea. After enucleation of the left eye the sympathetic ophthalmia healed well, but it repeatedly relapsed for nineteen years, with final recovery and normal vision after correction. The choroid showed small white peripheral foci which subsided completely. Examination of the blood revealed decrease of polynuclear leucocytes and increase of mononuclear cells, especially lymphocytes. By some authors this is considered characteristic of sympathetic ophthalmia. C. Zimmermann.

Melanowski, W. H. **Contribution to the pathogenesis of sympathetic ophthalmia. A case of sympathetic ophthalmia due to intraocular melanosarcoma.** Klin. M. f. Augenh., 1936, v. 97, July, p. 52.

A girl of twelve years affected with melanosarcoma of the choroid of the left eye developed sympathetic ophthalmia of the other eye. The left eye was enucleated after several months, and under treatment with injections of malarial blood and neosalvarsan the right eye recovered. After five years it had normal vision. As the number of cases of sympathetic ophthalmia with intraocular melanosarcoma is very small, another etiologic factor seems necessary. This factor may be tuberculosis. The patient was delicate and had a brother with pulmonary tuberculosis. (Illustrations.) C. Zimmermann.

O'Brien, C. S. **Tuberculosis of the uveal tract.** Trans. Pacific Coast Oto-Ophth. Soc., 1935, 23rd annual meeting, pp. 67-77.

This is a general review of the subject. Probably the safest and most accurate diagnostic method is Mantoux's intradermal injection. The dose used in treatment should not be so small that antibody formation is not stimulated or that no reaction is generated in the lesion. Treatment should begin with a dose much smaller than that which produced a diagnostic local reaction. W. H. Crisp.

Tooke, F. T. **Tuberculosis of the choroid associated with generalized miliary tuberculosis.** Trans. Amer. Ophth. Soc., 1935, v. 33, p. 201. (See

Amer. Jour. Ophth., 1936, v. 19, April, p. 358.)

8

GLAUCOMA AND OCULAR TENSION

Hosford, G. **Cortin in glaucoma.** California and Western Med., 1935, v. 43, Oct., p. 254.

In a 35-year-old female, tension dropped from 60 to 45 mm. of mercury after intravenous injection of 1 c.c. of cortin. She was thus tided over the acute stage until surgery could be done.

Theodore M. Shapira.

Palmieri, Carlo. **The effect of intravenous injection of hypertonic solution of sodium chloride on intraocular tension.** Ann. di Ottal., 1936, v. 64, April, p. 217.

The author reviews our present knowledge of physiologic chemistry; of the genesis, flow, and physiochemical properties of the ocular fluids and of the blood; and of the elasticity of the enveloping tissues of the eyeball. He discusses the idea, first advanced by Cantonnet, that osmosis in glaucoma might be increased by hypertonic intravenous injections. We must distinguish between colloidal suspensions and true solution in which there is actual molecular and ionic dispersion. Experiments were made on a number of glaucomatous patients under carefully noted conditions. In every instance, in varying forms of glaucoma, there followed a diminution of tension, differing in degree, rapidity, and duration. The effects lasted from six to eighteen hours. Neither polydipsia nor polyuria followed the injections. The author considers the ocular hypotension obtained as due to the increased colloido-osmosis of the blood. Even a temporary reduction of tension may be a great aid before operative intervention. (Bibliography.) Park Lewis.

Weekers, L., and Fanchamps, J. **Contribution to the clinical study of consensual ophthalmotonic reactions.** Arch. d'Opht., 1936, v. 53, July, p. 513.

Various experimenters, by contusing or cauterizing or otherwise injuring an eye, have produced an ophthalmotonic reaction in the other eye. Clinical experience supports this finding. The authors report two such cases, one of hypermature intumescent cataract with acute glaucoma in the right eye. The intraocular tension fell in both eyes following pilocarpin instillations in the affected eye. Case two was one of glaucoma secondary to iritis in one eye. The tension fell synchronously in both eyes following treatment to the affected eye. The authors explain this action as due to a vasomotor tie-up between the two eyes by way of the nervous system; and they point out that other paired organs (arms, kidneys) have shown similar vasomotor reactions. (References.)

Derrick Vail.

9

CRYSTALLINE LENS

Aliquo-Mazzei, A. **Cataract from dysfunction of the internal secretory glands.** Lettura Oft., 1936, v. 13, April, p. 123.

Observations are presented in three cases of myotonic dystrophy and in two of pituitary disease. The pituitary cases were submitted to X-ray studies of the skull. Endocrine dysfunction is said to be present in juvenile and presenile cataract more commonly than is generally believed. One or another gland may be the chief influence in a given case but in general a polyglandular syndrome exists in which the pituitary plays an appreciable part. (Extensive bibliography.) F. M. Crage.

Arruga, H. **The advantages and inconveniences of total extraction of cataract.** Bull. Soc. Franç. d'Opht. 1935, v. 48, pp. 218-222.

The advantages of intracapsular extraction are freedom from after cataract, absence of local reaction, rapid restoration of vision, and the possibility of extracting immature lenses. The disadvantages are more difficult technique, loss of vitreous, incarceration of iris. The method is not applicable to congenital, traumatic, intumescent, or hypermature lenses. Hyphema is more frequent after intracapsular extraction.

The advantages outweigh the disadvantages. P. J. Leinfelder.

Brown, E. V. L., and Evans, E. I. **Studies on the crystalline lens. The nature of the reducing substances in the lens.** Trans. Amer. Ophth. Soc., 1935, v. 33, pp. 220-236.

This highly technical paper does not lend itself to abstract. It discusses the presence or absence of cystin or cystein in the crystalline lens, the sulphhydryl substance in the lens, the autocatalytic growth of cattle lens, the progressive amount of glutathione in the lens, the ascorbic acid content, and the chemical changes following administration of naphthalene in dogs and rabbits.
David O. Harrington.

Burky, E. L., and Henton, H. C. **Staphylococcus toxin combined with lens extract as a desensitizing agent in individuals with a cutaneous sensitivity to lens extract.** Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 782-785.

Clark, J. H. **The effect of ultraviolet radiation on lens protein in the presence of salts and the relation of radiation to industrial and senile cataracts.** Amer. Jour. of Physiology, 1935, v. 113, Nov., p. 538.

Experiments show that the higher incidence of cataract in workers exposed to molten glass and metals is due to increased rate of precipitation of light-denatured protein when the lens is heated above body temperature by exposure to large sources of radiant heat, and when low concentrations of calcium or other substances producing similar effect are present.
Theodore M. Shapira.

Hildreth, H. R. **The fluorescent lamp for cataract surgery.** Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 770-773.

Horváth, Béla. **Cataract operation with subsequent extraction of the capsule.** Klin. M. f. Augenh., 1936, v. 96, June, p. 746.

A large incision with Rosa's discission needle is made into the capsule near its equator and after removal of the lens the capsule is grasped and extracted with the author's specially constructed forceps, while the central edge of the corneal wound is being lifted with forceps. The single steps of the operation are described in detail with illustrations. C. Zimmermann.

Jeandelize, Baudot, and Gault. **Aphakia and detachment of the retina.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 305-316. (See Section 10, Retina and vitreous.)

Kalt, E. **Intracapsular extraction of senile cataract with forceps.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 243-246.

Kalt obtains intracapsular extractions in sixty percent of his cases. He believes sutures are needed for closure of the wound. P. J. Leinfelder.

Nesi, Vicente. **A new model of erisiphake.** Rev. de Ophth. de São Paulo, 1936, v. 4, May, pp. 243-246.

The apparatus is illustrated and briefly described.

Puiggari, M. I., and Adrogué, E. **2,330 cataract operations performed with the forceps (total extraction).** La Semana Med., 1936, v. 43, April 9, pp. 1117-1129.

Detailed description of the intracapsular operation is given. The Arruga forceps is preferred. The authors feel that the intracapsular technique should be attempted in almost all cases of cataract operation, even in cases of juvenile cataract, with or without heterochromia, and in varieties of traumatic cataract in which the capsule is easily torn. W. H. Crisp.

Raverdino, Emilio. **Forceps extraction of traumatic cataract.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 215-217.

The author discusses the value and technique of intracapsular extraction of traumatic cataract.
P. J. Leinfelder.

Roche, C., and Roux, A. **The myth of the mature cataract.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 207-214.

The author discourages the practice

of allowing cataracts to become ripe before operating. He believes it impossible to tell when a cataract is completely opaque, and even though it appears mature the extraction is not more simple than for an immature lens. Residual cortex is rapidly absorbed. Sclerosed lenses may never become completely opaque, and the patient is forced to endure poor vision for many years. P. J. Leinfelder.

Sourdille, Gilbert. **Extraction of the lens in its capsule.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 233-242.

Since 1930 the author has done 527 cataract extractions, of which 472 were intracapsular. He reviews the results and explains his technique, which follows Elschnig's principles. He uses a large incision (more than two-fifths of the cornea) preserves the round pupil when possible, grasps the lens below, and delivers it by tumbling. Stitches are used to close the wound. The complications differ little from those of the extracapsular method. Hyphema is not infrequent, but is believed to be due to trauma by the patient.

P. J. Leinfelder.

Sourdille, G. P. **Statistics on intracapsular extractions.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 223-233.

The results and complications, operative and postoperative, are given for 239 cataract extractions of which 182 were intracapsular and 57 extracapsular. P. J. Leinfelder.

Terson, A. **Location and technique of optical iridectomy in zonular cataract.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 199-206.

In patients with zonular cataract vision can frequently be improved by means of mydriasis and stenopeic glasses, as often there is greater visual acuity in one area of the lens than in others. The author does optical iridectomy and finds the position of choice is usually upward or in the superior nasal quadrant. He has devised a shell which fits over the cornea, but leaves a slit opening to represent the iridectomy. By rotating this appliance the best point for operation is localized. A complete but narrow iridectomy is usually best. (Illustrations.)

P. J. Leinfelder.

Trematore, M. **Xeroderma pigmentosum and cataract.** Lettura Oft., 1936, March, p. 103.

Mention is made of reports in the literature of cataract associated with special dermatoses. Only one other case of xeroderma pigmentosum with cataract could be found among them. The author reports a case of xeroderma pigmentosum with bilateral posterior cortical cataract in a female aged eighteen years. The skin condition began on the right side of the face. With proper protection to the eyes this side only was treated with X ray several times (1926). Progressive diminution in vision has occurred in both eyes in the past two years. Under the slitlamp both lenses showed opacities in the posterior layers of the cortex. The author advances the hypothesis that these bilateral posterior cortical cataracts may be caused by the same factors which produce the xeroderma pigmentosum. (Bibliography.) F. M. Crage.

Von Bahr, Gunnar. **Studies on the etiology and pathogenesis of zonular cataract.** Acta Ophth., Supplement 11, 1936, v. 14.

A very exhaustive review of the literature is followed by detailed report of experimental studies on rats, which were placed on a rachitogenic diet, and examined for the effect of this diet and its modifications on the development of lenticular opacities, tetany, and hypoplasia of dental enamel. Uncomplicated rickets did not produce lenticular opacities; but in rickets complicated with sufficiently advanced tetany lenticular opacities in the superficial cortical layers occurred regularly. These opacities continued to develop after recovery from tetany, with subsequent formation of a zonular cataract, clear fibers enclosing the opaque portion of the lens. In these experiments tetany occurred in response to a high phosphorus increase in the rachitogenic diet. Malformations in the dental enamel could

not so clearly be attributed to tetany, although they were found more frequently in rachitic rats with tetany than in uncomplicated rickets. The lenticular changes appeared partly as vacuoles containing an opaque substance between the lens fibers, and partly as radial lines and very marked ground glass zones of discontinuity. The author concludes that human zonular cataract is due to infantile tetany which usually depends on rickets, and thus indirectly on a nutritional deficiency. The author's experimental data do not support the belief that maternal tetany during pregnancy may cause zonular cataract in the offspring. They suggest that hypocalcemia is an essential factor in formation of cataract. (Illustrations.) Ray K. Daily.

Vormann. **Contribution to A. Vogt's late contusion rosette.** Klin. M. f. Augenh., 1936, v. 96, June, p. 819. (See Section 16, Injuries.)

Walker, C. E., Jr. **A modified capsule forceps for cataract extraction.** Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 794-795.

Yudkin, A. M., and Arnold, C. H. **Cataracts produced in albino rats on a ration containing a high proportion of lactose or galactose.** Trans. Amer. Ophth. Soc., 1935, v. 33, pp. 281-290. (See Amer. Jour. Ophth., 1936, v. 19, April, p. 362.)

10

RETINA AND VITREOUS

Alajmo, B. **Coats's retinitis.** Boll. d'Ocul., 1936, v. 15, April, pp. 405-416.

A man of 36 years, with negative family and personal history, showed marked conjunctival and pericneal injection of the right eye. The vision was totally abolished, the anterior chamber deeper than the left one, the iris entirely adherent to the lens capsule, and the tension increased. The retina was separated especially in the nasal and temporal sectors. Histologic examination of the enucleated eye showed an abnormal substance between retina and choroid. This, according to the author, was a fluid of choroidal origin very rich in albumen and other material derived from necrosis of the pigment epithelium. The changes in retina and retinal blood vessels are to be considered as a result of trophic, mechanical, and toxic changes in the choroid. The etiology of the disease remains obscure. (11 figures.) M. Lombardo.

Allen, J. H., and Howard, W. A. **Lipemia retinalis.** Amer. Jour. Ophth., 1936, v. 19, Aug., pp. 645-648.

Ankell, Gonzalez. **From Poulard to Gonin, retinal detachment.** Rev. de Ophth. de São Paulo, 1936, v. 4, May, pp. 247-276.

This thirty-page article (in Spanish) in a Portuguese language journal is devoted chiefly to detailed description of the Gonin operation, with preliminary localization, and a discussion of complications. W. H. Crisp.

Arruga, H. **Prognosis in treatment of retinal detachment.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 348-355.

In general detachments are less amenable the longer they have existed. Young patients form scars more readily and offer a better prognosis, and those in good general health are more successfully treated. Cases caused by severe traumatism have a very bad prognosis. Ora serrata tears are usually placed inferiorly, and yield quickly to treatment. Superior detachments are more serious than inferior, and temporal ones cause greater destruction of vision than nasal ones. Multiple tears, aphakia, degenerative lesions of the retina, and hyperemia of the eye increase the seriousness.

P. J. Leinfelder.

Brenta, J. **A case of external exudative retinitis (Coats).** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 164.

Busacca, A. **Withdrawal of cerebrospinal fluid in cases of hypertensive retinitis.** (Italian paper in polyglot Brazilian journal.) Folia Clin. et Biol., 1936, v. 8, no. 2, pp. 41-47.

In 1932 and 1933 Magitot and Dubois, in two successive communications, reported a number of cases in which symptoms of retinitis regarded as hypertensive had receded or had even been cured with appreciable recovery of visual function, after withdrawal of cerebrospinal fluid. Busacca has applied this method to two cases which he now reports. In the former, one of hypertensive retinitis with diabetes and albuminuria and with hypertension of the cerebrospinal fluid, withdrawal of that fluid, undertaken when the ocular disturbance was in an advanced stage of development, produced slight transitory improvement of the ocular symptoms but did not prevent their further progress. In a case of retinitis from essential hypertension, with compensated diabetes and hypertension of the fluid, withdrawal of the fluid, started a little while after onset of the ocular disturbance, produced rapid absorption of the retinal exudates and hemorrhages with improvement of visual function. Busacca raises a number of questions with regard to the principle involved, and says that the validity of the procedure can only be determined after a great many trials.

W. H. Crisp.

Danis, M. **The retinal complications of nephritis.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 26.

This comprehensive study includes a brief history of the subject, a consideration of the retinal lesions, and finally of pathogenesis. From statistical study of 49 cases treated at the University of Brussels, the following conclusions are reached: When nephritis is complicated by retinitis the mortality increases considerably. Retinitis occurs in chronic glomerulo-nephritis, in renal sclerosis, in infectious glomerulo-nephritis, and in malignant hypertension; not in lipoid nephrosis or in hemorrhagic nephritis. The general arterial tension is always increased in nephritis accompanied by retinitis. Albuminuric retinitis is always accompanied by arterial hypertension. Azotemia is very frequent but not constant. In the present state of our knowledge the mechanical vascular theory appears the most probable.

Jerome B. Thomas.

Fralick, F. B., and Peet, M. M. **The hypertensive fundus oculi after resection of the splanchnic sympathetics.** Trans. Amer. Acad. Ophth., and Otolaryng., 1935, 40th annual meeting, p. 119. (See Amer. Jour. Ophth., 1936, v. 19, Sept., p. 815.)

Franceschetti, A., and Roulet, E. **Syndrome of Groenblad and Strandberg (angioid streaks of the retina and pseudoxanthoma elastica) and its relation to mesenchymal affections.** Arch. d'Opht., 1936, v. 53, June, p. 401.

Since Groenblad and Strandberg were the first to demonstrate the relation between angioid streaks and pseudoxanthoma elastica, the disease should be known as their syndrome. Two fairly typical cases are described and illustrated. After exhaustive review of the literature, the various theories as to the cause of the fundus picture are discussed. The authors incline toward the theory of Kofler and Groenblad, that a rupture of the lamina vitrea is responsible. There is also a close relationship between macular hemorrhage and senile pseudotumor of the macula, both of which may be considered as alterations of the elastic tissue and of blood vessels. The hereditary features, as analyzed from the literature, are believed to be of the recessive type. (Illustration, bibliography.)

Derrick Vail.

Fritz. **Alterations of the retinal circulation in changes of position of the body.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 264.

In a former paper the author had sought to prove that perfusion of blood at the level of the retina was maintained physiologically at an optimum quantity by an adaptation of the blood pressure to the caliber and elasticity of the vessels. This would seem to offer evidence of analogous conditions of the cerebral circulation. These ideas suggested study of the behavior of the retinal circulation in the course of changes in bodily position. If one meas-

ures simultaneously the brachial and retinal blood pressures it is found in a certain number of cases that there is no change in either pressure during changes of position of the body. This proves that above the mechanism for cardiac regulation there exists a mechanism for local vascular regulation. An important variability (0 to 25 mm. of mercury) was found to obtain among different individuals in regard to the regulation which the organism is prepared to oppose to hydrodynamic changes resulting from changes of position of the head with reference to the heart. These qualities are of great practical importance in aviators, who by the nature of their profession are subjected to sudden and violent changes of position in space, and in whom regulation of the cerebral and retinal pressure is of paramount importance.

Jerome B. Thomas.

Fritz. **Contribution to the physiopathology of retinitis.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 280-287. (See Amer. Jour. Ophth., 1936, v. 19, April, p. 363.)

Fritz. **Dichrotic pseudopulse of the retinal vein.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 259.

Alternating venous pulse arises from adhesion between the arterial and venous walls, and is manifested by diastole at the moment of arterial systole. Exceptionally the normal venous pulse and the alternating venous pulse just described may overlap so as to give rise to a dichrotic venous pulse forming a transition between the primary and the alternating venous pulse.

J. B. Thomas.

Govaerts, Paul. **Classification of nephropathies based upon renal physiopathology.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 15.

This 35-page paper discusses the subject exhaustively. When nephritis is complicated by retinitis the prospect of death is considerably increased. Retinitis is encountered in chronic glomerulonephritis, in renal sclerosis, in infectious glomerulonephritis, and in malignant hypertension. It is not found in lipoidal nephrosis or in hemorrhagic nephritis. The general arterial tension is always increased in cases of nephritis with retinitis. J. B. Thomas.

Granit, Ragnar. **The electrophysiology of the retina and optic nerve.** Acta Ophth., Supplement 8, 1936, v. 14.

The action potential of the retina or the electroretinogram was discovered by Holmgren in 1865. The use of vacuum amplifiers, attached to a string galvanometer, permitted Chaffee, Bovie, and Hampson to study the electroretinogram in detail. Hautline in 1925 demonstrated that the electroretinogram of the excised eye is identical with the electroretinogram of living animals, and he also registered the human electroretinogram in 1931. The author and his co-workers studied the human electroretinogram with the amplifiers and the string galvanometer, and they made numerous studies of the electroretinogram of doves, eels, rabbits, and cats. These studies show that the electroretinogram is a complex curve of three components of various time relations and electrical signs: state of adaptation, intensity of stimulus, and size of stimulated area. A study of the relation of the components of the electroretinogram to the impulses of the optic nerve shows that the retina generates excitatory and inhibitory impulses, which can be differentiated on the electroretinogram. In 1855 Schafhautl used intermittent light for the study of the visual processes. When rapidity of stimulation reaches a certain frequency the light is perceived as a continuous stimulus, and the number of stimulations per second required to achieve this effect is known as the fusion frequency. The fusion frequency and the electroretinogram can be used as a quantitative and objective measure of the visual retinal processes. An exhaustive study of the electroretinogram of intermittent stimulation leads the author to believe that the electrical reaction points to the presence of two types of retinal elements. The positive wave corresponds to the excitation element associated with an increase of im-

pulses in the optic nerve, and the negative wave represents the inhibitory element associated with inhibition of impulses in the optic nerve. The retina of the dove is of the inhibitory type, that of the cat of the excitation type. In the other animals the retina was found to possess a mixture of both elements. The rods predominate in the excitation type of retina, while the cones are linked with the inhibition elements. The human retina is centrally of the inhibition type and peripherally of the excitation type. The excitation elements are most active in dark adaptation and have a low fusion frequency. The inhibitory system has a high fusion frequency and is most responsive in light adaptation and to intense stimuli. In diseased conditions the fusion frequency is lowered and the electroretinogram shows that the inhibitory elements are more resistant than the excitation elements, and that each system may be selectively involved. This method of examination may thus serve in the differential diagnosis of retinal diseases. Such studies in glaucoma demonstrate that the excitation elements are the first to be attacked. The author believes that this method of studying retinal function will yield more precise information than that obtained by photometric methods.

Ray K. Daily.

Greeves, R. A., Marshall, J. C., Adams, P. H., Butler, T. H., and others. **Analysis and results of cases operated upon for retinal detachment.** Trans. Ophth. Soc. United Kingdom, 1935, v. 55, pp. 392-407.

Greeves reports on seventy consecutive cases of detached retina which were operated upon by the non-perforating diathermy method. The blunt electrode was used, and the subretinal fluid evacuated by trephining down to the choroid and puncturing the choroid with a lacrimal dilator. The final results were 36 cures out of the seventy cases operated upon. In the cured cases were included only those in which no residual detachment was visible.

With the use of Gonin's thermocautery puncture, and the diathermy micropuncture method as advocated by Safar, Marshall operated upon 74 cases with 34 cures, and 16 improved. The worst failures were in the cases operated upon two or three times.

The author concludes that the future of detachment operations will be greatly influenced by the way the surgeon watches the progress of the case with the ophthalmoscope during the operation. Surface coagulation together with micropunctures to let out fluid will probably be found the best method of operating.

Twelve cases including fourteen eyes were operated upon by Adams, all with good results; in seven eyes with no detachment visible and vision improved to between 6/18 to 6/9.

Butler reports 21 operations. In twelve, holes or tears were found. In six, the detachment was cured, and in six the vision was improved or restored to normal. Of six cases with holes operated upon by Gonin's method, three were successful and three failures. In the cases without holes only about twenty percent were successful and diathermy was far more successful than the Gonin method.

Beulah Cushman.

Heine, L. **Amotio retinae.** Deut. med. Woch., 1936, no. 25, June 19, p. 1008.

In this article Heine discusses the various etiologic factors concerned in producing retinal detachment. In order of importance he discusses trauma, myopia, iridocyclitis, chorioretinitis, and tumors. He states that with Uhthoff he reviewed the whole subject of retinal detachment thirty years ago and that since then only the methods of examination and treatment have been improved, the underlying principles being still the same.

Theodore M. Shapira.

Jensen, V. A. **Clinical studies of tributary thrombosis in the central retinal vein.** Acta Ophth., Supplement 10, 1936, v. 14.

Detailed reports of 61 cases of thrombosis of a branch of the central retinal vein in 54 patients. In 56 percent of the patients the obstruction was in the up-

per temporal and in 36 percent in the lower temporal vein. Seventeen subsequently presented a picture of retinitis circinata, and in sixteen there were secondary central changes. Thrombosis from a branch, unlike thrombosis of the central vein, has no tendency to cause glaucoma. The thrombosed retinal region may be the seat of recurrent hemorrhages which give rise to opacities and retinitis proliferans. The duration of life subsequent to occurrence of thrombosis is variable, and the disorder is of no prognostic significance relative to life. Ray K. Daily.

Kraupa, Ernst. **Central retinochoroiditis of congenital syphilis.** Zeit. f. Augenh., 1936, v. 89, June, p. 204.

Central retinochoroiditis in congenital syphilis was not commonly observed even before syphilis had decreased in frequency. Kraupa saw only two characteristic cases in 22 years. The first, seen in 1914, was in a fifteen-year old infantile female with Hutchinson teeth. In the right eye there was a central densely pigmented chorioretinal lesion and peripherally a pepper and salt retina. The other patient (1920), a thirty-year old woman, with signs typical for congenital syphilis, had a large chorioretinal lesion in each macula, eight discs wide in the right and four in the left. Peripherally the fundus had a coarse pigment disturbance. In the center of the lesion of the right eye was a yellowish, sharply defined spot smaller than the papilla. In very intense light it seemed to be a cryptic cavity. In neither patient was the appearance and location of the lesion such as to distinguish it from a retinochoroidal lesion from other cause.

Kraupa surmises that his lesions are the end result of a gummatous process, although Rönne thinks lesions of this type develop at the same period with typical excavated coloboma of the macula. F. Herbert Haessler.

Kyrieleis, Werner. **Eyeground changes in lymphogranulomatosis.** Zeit. f. Augenh., 1936, v. 89, June, p. 193.

Hodgkin's or Sternberg's disease simulates leukemia in that swellings of the lymph nodes and spleen occur, but without the characteristic blood picture of leukemia. The lymph nodes of the orbit and lids, and also the lacrimal gland, are occasionally involved. Kyrieleis's patient had been observed for six years but his eyes were examined for the first time six days before death. The optic papillae were normal, the arteries dilated to the diameter of an average vein, and all the vessels very tortuous. Near the papillae were many fiber-layer hemorrhages, and in each eye was a large preretinal hemorrhage. Lids and conjunctiva were normal and there was no exophthalmos. Histologically, no lymphogranulomatous changes were found in the eyeball. The secondary anemia had produced the retinopathy. F. Herbert Haessler.

Mamola, P., and Bellina, G. **New ideas of the pathogenesis and treatment of retinitis pigmentosa.** Rassegna Ital. d'Ottal., 1935, v. 4, Nov.-Dec., p. 699.

The authors present a review of the most important theories. The frequent accompaniment of mental disturbances with the condition suggests a mesencephalic syndrome. Careful investigation of such cases often reveals disturbance of the hypophysis, further supported by the fact that administration of ovarian hormone benefits the eye condition. Eight cases of pigmentary degeneration were studied by X rays of the skull, water metabolism and carbohydrate tolerance. The authors conclude that there is actually a disturbance of function of the hypophysis. Their patients were apparently bettered by intramuscular administration of anterior pituitary extract. (13 figures.)
Eugene M. Blake.

Mecca, Mario. **Retinitis pigmentosa, clinical and experimental contribution on its etiology and therapy.** Ann. di Ottal., 1936, v. 64, March, p. 172, and April, p. 252.

The author makes a very complete study of the present status of this disease. The pathogenic mechanism involves two factors, one local and one general, a vascular and a neuro-endo-

crine lesion. That spasm of the retinal vessels is present is substantiated clinically by therapeutic results obtained with vasodilator drugs. The author has found in every patient evidence of endocrine imbalance. He concludes that disturbed vascular equilibrium is basic in the affection. As concerns the therapeutic value of acecolin the results obtained by Corrado are fully substantiated. Injection of adrenalin into the vitreous of rabbits produced an ophthalmoscopic picture in accord with that presented in pigmentary degeneration of the retina. Detailed reports on a number of patients are given. The literature is carefully reviewed and the conclusions of previous authors are summarized. (Bibliography, 4 plates.)

Park Lewis.

Musabeili, I. **Retinal hemorrhages in malaria.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 5, p. 726.

By review of the literature and report of seven cases, the author shows that malarial involvement of the posterior ocular segment is usually in the form of hemorrhagic retinitis. This is most frequently seen in tropical malaria, is absorbed under treatment, and has a favorable prognosis. In acute attacks it is probably caused by hyalin thrombosis, parasitic embolus, or toxic changes in the vessel walls. In chronic malaria the hemorrhages are probably caused by a change in the composition of the blood and blood vessels resulting from secondary anemia.

Ray K. Daily.

Pischel, D. K. **An unusual case of bilateral retinal detachment.** Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 795-796.

Sanctis, G. E. de. **The visual fields in retinal detachment after surgical treatment.** Rassegna Ital. d'Ottal., 1935, v. 4, Sept.-Oct., p. 589.

De Sanctis carefully describes the condition of the eyes before and after surgical treatment in five cases of retinal detachment, one bilateral. The fields for white, blue, red and green are reproduced. Fields were first taken in good daylight and then in the dusk, but no quantitative measurements of light were made. Operation was performed in from a few days to four months after detachment appeared. The time element did not affect the findings materially. After surgical reattachment there remains a functional defect—limitation of field—in the sector corresponding to the detached retina. The field defect is considerably larger when the examination is made under reduced light, a fact which the author considers valuable in examination. (One figure.)

Eugene M. Blake.

Strampelli, B. **The diathermic diaphanoscope in the treatment of retinal detachment.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 370-372. (See Amer. Jour. Ophth., 1936, v. 19, Feb., p. 185.)

Streiff, J. **A superficial scleral flap to facilitate Gonin's operation and withdrawal of vitreous.** Zeit. f. Augenh., 1936, v. 89, June, p. 197.

Because the sclera is so resistant, the pressure necessary to introduce a needle large enough to draw off abnormal vitreous is dangerous to the eyeball. Streiff has excogitated a procedure for making a trapdoor-like flap, to facilitate puncture of the inner coats of the eyeball. He also finds this flap helpful in performing Gonin's operation for retinal detachment.

F. Herbert Haessler.

Van Bogaert, L. **Ophthalmologic interest in the group of dyslipidoses.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 154.

Pigmentary degeneration of the retina in persons mentally sound may give rise in their descendants to severe cases of amaurotic idiocy which completely lack the visual troubles and changes in the eyegrounds. Amaurotic idiocy is only one of the forms of the dyslipid group of which the others are just beginning to be defined. If phosphatid lipidosis has such a marked predilection for brain and retina, is the same true of the other morbid types of this great group? Recent collaboration of ophthalmologists and neurologists raises this important question: Do the pro-

gressive and familial macular degenerations, certain forms of hereditary deafness, the diseases of Gaucher, Niemann-Pick, amaurotic idiocy, and certain types of atypical retinitis pigmentosa constitute a single pathologic group which rests on a primary deviation of the lipid metabolism? (Bibliography of 21 references.)

Jerome B. Thomas.

Veil, P., and Dollfus, M.-A. **Comparative value of different techniques of obliteration of retinal tears.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 380-385. (See Amer. Jour. Ophth., 1936, v. 19, April, p. 365.)

Weekers, L. **Some considerations on the operative treatment of retinal detachment.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 326-343. (See Amer. Jour. Ophth., 1936, v. 19, Jan., p. 72.)

Weekers, L. **Operative cure of retinal detachment complicating tuberculous uveitis.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 141.

Minute perforations were made with a knife through conjunctiva and the ocular coats, and a weak diathermic current was then passed through the knife to produce hemostasis.

J. B. Thomas.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Alpers, B., and Yaskin, J. **Choked disc in syphilis.** Amer. Jour. Med. Sciences, 1935, v. 190, Sept., p. 333.

The authors present five cases of choked disc in lues of the central nervous system, four of which responded well to antiluetic treatment. The fifth patient was operated on with good result. The authors conclude that the underlying lesion is probably a basilar meningitis. Theodore M. Shapira.

Denti, A. V. **Solitary tubercle of the papilla.** Rassegna Ital. d'Ottal., 1935, v. 4, Nov.-Dec., p. 819.

Denti considers the various disease conditions which may localize in the optic-nerve head and describes their symptomatology. A solitary tubercle at this site occurred in the left eye of a male aged 33 years. There was a strong family history of tuberculosis. The growth involved the periphery of the papilla, was grayish in color, showed no new-formed vessels or pigment deposits. It displaced the vessels on the nerve head. The outcome of the case is not related. (One figure.)

Eugene M. Blake.

Jensen, C. D. F. **Hyaline bodies (Drusen).** Trans. Pacific Coast Oto-Ophth. Soc., 1935, 23rd annual meeting, p. 59. (See Amer. Jour. Ophth., 1936, v. 19, Jan., p. 74.)

Lauber, H. **Concerning the influence of low blood pressure upon diseases of the optic nerve.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 429-438. (See Amer. Jour. Ophth., 1935, v. 18, Dec., p. 1176.)

Pickard, Ransom. **The clinical course of cavernous atrophy and its relation to the normal enlargement of the optic-disc cup.** Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 599.

The author considers patients in whom the cupping of the optic disc had increased in size from 45 to 50 percent without increased tension, and the usual effect of this on the visual fields and light threshold and the tensions found. Cavernous atrophy simulates chronic glaucoma, in which it also happens as an early symptom, and its occurrence suggests an affection of the optic nerve head in which the various tissues are affected in varying degree. The author concludes that the condition does not tend to lead to blindness. Even in severe cases the deterioration of central vision and fields is usually very slow. Beulah Cushman.

Rubino, Alfio. **An atypical case of medullated nerve fibers.** Rassegna Ital. d'Ottal., 1935, v. 4, Sept.-Oct., p. 602.

A ten-year-old girl showed in one eye an unusual picture of myelinated nerve fibers. The patch began a half disc-diameter from the upper border of the

nerve as a small, clear-cut band which gradually enlarged and faded away toward the periphery. It began behind a large vessel which it partially invaginated, the white patch starting to enlarge at the bifurcation of this vessel. The nasal borders were clearly defined, while the temporal side presented the usual frayed-out appearance. The color was whitish but not uniform, and along the course of the vessels it was ivory. The upper edge faded gradually into a reddish-white and finally merged into the red of the fundus. Rubino explains this picture upon the basis of different chronological development of the lamina cribrosa and the nerve sheaths, some of the nerve fibers becoming compressed and cut off from the others and appearing in the retina under the familiar appearance of myelinated fibers. (One figure.) Eugene M. Blake.

Skirball, J., and Thurmon, F. **Ocular reactions due to arsphenamine.** Amer. Jour. Syphilis and Neurol., 1935, v. 19, April, p. 197.

The authors present twenty cases showing definite toxic reactions due to arsphenamine. On the basis of their work they conclude that all patients receiving this drug should submit to an ocular examination before it is administered. There should be frequent ocular examinations at definite periods during treatment with this drug. No ocular symptom should be minimized during such treatment. If the drug is stopped, symptoms clear up rapidly; if continued, symptoms become worse. The ocular picture encountered is one of neuritis with retinal hemorrhages.

Theodore M. Shapira.

Soriano, F., Malbran, J., and Piccoli, H. R. **Toxic amblyopias from pentavalent arsenicals (acetylarsan).** La Semana Med., 1936, v. 43, July 16, pp. 159-167.

Two cases are reported. The first patient had double renal lithiasis with infection, and chronic renal insufficiency due to reduction of the renal parenchyma. The second patient had acute toxic nephritis, acute toxic anemia, and amaurosis, as well as perihepatitis, pulmonary congestion, paraplegia, and polyneuritis. The toxic action of the arsenical was unquestionable. The authors believe that the affinity of the pentavalent arsenicals for the optic nerves may be emphasized by renal and hepatic insufficiency. The disturbances in these two cases are attributed to the toxicity of the drug and not to phenomena of reactivation. Treatment of the complication is ineffectual.

W. H. Crisp.

12

VISUAL TRACTS AND CENTERS

Jeandelize, P. **Certain aspects of the relations of the hypophysis and the visual apparatus.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 49.

This invitation lecture delivered before the Belgian Ophthalmological Society occupies 46 pages and is illustrated by 45 figures. After reviewing the anatomy, the author discusses the influence of the visual apparatus upon hypopyseal function, and concludes that a relation exists between the eyes and the hypophysis concerning the function of the melanophores, and that light acts through the eye to produce pigmentary reactions by means of hormones or to activate the evolution of gonads. The existence of a reflex arc between retina and hypophysis has been demonstrated, passing by way of the supraoptical center of the hypothalamus.

According to modern experiments overactivity of the hypophysis plays the most important part in the genesis of hyperthyroidism. The hypophysis becomes enlarged and enters a stage of hyperactivity when the thyroid is atrophied or insufficient. The author maintains that exopthalmos is independent of hyperthyroidism and may occur under the influence of the hypophysis. It is suggestive that one encounters bitemporal narrowing of the field in cases of Basedow's disease operated on by thyroidectomy.

In migraine, recent studies by Drouet and others have shown that there exists

an almost constant participation of the hypophysis evidenced in elimination of the melano-dilator principle in the urine after each crisis, in temporary bitemporal (and other) narrowing of the visual fields, and in retinal tension generally more elevated on the painful side.

Recent studies lead to the following conclusions by the lecturer in regard to recurrent hemorrhages of the young: (a) confirmation of the existence of hyperthyroidism or hyperpituitarism, or even the absence of both, and in the latter case functional modification of another gland such as the adrenal or ovary; (b) the almost constant existence of the pigment reaction (melanophorotrope) obtained with the patient's urine; (c) when transparent media permit the tests, bitemporal field defects and retinal hypertension; (d) encouraging results of irradiation of the hypophysis associated sometimes with ovarian therapy. Three case histories are reported in support of these views.

As to therapy, the use of the endocrine extracts in cases where hyperpituitarism is secondary has long been successfully practised; but when primary it is necessary to add some direct treatment of the overactive hypophysis. The X-ray is the only effective means of such treatment. It has been used by the author and Drouet for several years in recurrent vitreous hemorrhages and by others in Basedow's disease, migraine, and hypertension. The lecturer warns against insufficient dosage which may merely serve to excite the hypophyseal cells and lead to new hemorrhages. Jerome B. Thomas.

Redslob, E. **Complete blindness in an infant following vaccination against smallpox.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 126-135.

Total blindness developed rapidly in a child of fourteen months, nine days after vaccination. The fundi showed pallor and spasm of the arteries, the pupils were dilated and fixed. Treatment with "acécoline" resulted in gradual improvement with return to normal vision in three months. The fundi continued to show evidence of arterial spasm. P. J. Leinfelder.

13

EYEBALL AND ORBIT

Bailliart, P. **The ocular pulse.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 294-297.

The eye is perfectly adapted for measurement of pulse waves for it is a natural platysmograph. The changes in tension can be noted or transferred to a kymograph by means of a tonometer. Bailliart has studied the pulse waves by the method of Gomez and Langevin. A gravity plate is utilized; the changes in electric energy resulting from changes of pressure on this plate are transferred to a kymograph. Three curves are presented to illustrate the normal and pathologic tracings.
P. J. Leinfelder.

Braun, Reinhard. **Gravitating abscess in the orbit in tuberculous osteomyelitis with new-formed bone in the frontal sinus.** Zeit. f. Augenh., 1936, v. 89, July, p. 257.

There was unilateral exophthalmos with displacement of the eyeball down and in. Ten years earlier the lacrimal gland had been extirpated because of an erroneous diagnosis of neoplasm in the gland. During the following years, numerous subperiosteal abscesses developed in the orbit. The cause was tuberculous osteomyelitis in the medial portion of the right frontal sinus with new formation of bone. A tuberculous empyema of the sinus perforated into the orbit. Abscesses between the bone and periosteum of the orbital roof gravitated as far as the upper lid.
F. Herbert Haessler.

Chaldejev, S. I. **Conjunctivoplasty by the Gilles method.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 6, p. 855.

A case of restoration of the conjunctival sac with a skin graft held in place by a large glass sphere remaining in the orbit for two months. (Illustrations.) Ray K. Daily.

Gatewood, W., and Settel, N. **Osteoma of the frontal sinus.** Arch. of Otolaryng., 1935, v. 22, Aug., p. 154.

The authors report a case of osteoma

of the frontal sinus which was removed surgically with uneventful recovery.

Theodore M. Shapira.

Karsch, Johannes. **Inherited malformation of eyes associated with cleft hand and foot.** Zeit. f. Augenh., 1936, v. 89, July, p. 274.

In routine examination of the blind of Leipzig, a father and 37-year-old daughter were found who had similar eye lesions associated with malformations of hands and feet. Each had pendulum nystagmus, divergence of the right eye, and a retinal lesion which must most probably be classed with the tapetoretinal degenerations. Each had a cataract: the father's did not mature until late in life, but in the daughter a membranous cataract had manifested itself in youth. The father had synostosis of the third and fourth phalanges of one hand and foot, while the daughter had typical crab-claw hands and feet.

F. Herbert Haessler.

Kleefeld, G., and Leroy, F. **Importance of a radiologic examination in orbital inflammations of children.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 173.

In the six cases observed by the authors the orbital swelling appeared variously preceding and following other infections, such as mastoiditis in one case, otitis in another. Complete absence of nasal symptoms should not weaken the probable diagnosis of ethmoiditis. These are cases of closed ethmoiditis with a tendency to spread toward the orbit. In every case the radiogram affirmed a diagnosis of ethmoiditis. In all cases in which any sign threatens orbital phlegmon, and without waiting for certain signs of suppuration, one should drain the ethmoid. No attempt at exenteration should be made, but by pushing aside the middle turbinate and entering the ethmoid by puncture or curette one changes a closed to an open ethmoiditis and avoids puncture of the orbit.

Jerome B. Thomas.

Pfingst, A. **Pulsating exophthalmos in infancy.** Kentucky Med. Jour., 1935, v. 33, July, p. 327.

The author reports a case of pulsating exophthalmos in a twenty-month-old white female whose eye was finally removed. He discusses differential diagnosis and includes orbital neoplasm, nasal sinus disease, Graves's disease, arteriovenous aneurism, and simple aneurism of arteries and veins. Sections of the eye showed plastic iridocyclitis.

Theodore M. Shapira.

14

EYELIDS AND LACRIMAL APPARATUS

Abdulaev, G. G. **Surgical treatment of cicatricial trachoma.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 5, p. 712.

A detailed description of the technique of excision of the diseased conjunctiva and tarsus and transplantation of mucous membrane from the lip.

Ray K. Daily.

Abdulaev, G. G. **Surgical treatment of the lacrimal passages by Kankrov's method.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 5, p. 710.

After anesthesia of the lacrimal sac, the operation consists of slitting the lower canaliculus, passing Weber's knife through the stricture into the sac, and curettage of the sac. Of seventeen cases fifteen had restoration of function with cessation of epiphora.

Ray K. Daily.

Bakly, M. A. El. **Operation for the repair of coloboma of upper lid.** Bull. Ophth. Soc. Egypt, 1935, v. 28, p. 26.

A case of bilateral coloboma of the upper lid is reported in which repair was made by lining the colobomata with grafts from the mucous membrane of the lips and then utilizing the skin of the lower lid as a covering. The procedure is described in detail.

Edna M. Reynolds.

Bietti, Giambattista. **Bilateral blepharochalasis, dacryoadenoptosis and dacryops in a subject affected by hypothyroidism.** Boll. d'Ocul., 1936, v. 15, May, pp. 514-524.

A boy of fifteen years showed redundant skin of both upper lids, over-

hanging the lid margin at the outer end. Temporally there was a cystic formation beneath the conjunctiva, which appeared to be the lower end of the palpebral lacrimal gland, the whole gland seeming to be displaced downward. The patient showed symptoms of hypothyroidism, which was accepted as cause of the ocular manifestations. (Bibliography, 2 figures.)

M. Lombardo.

Dickey, C. A. **Superior-rectus fascia-lata sling in the correction of ptosis.** Amer. Jour. Ophth., 1936, v. 19, Aug., pp. 660-664: also Trans. Pacific Coast Oto-Ophth. Soc., 1936, 24th annual meeting.

Franceschetti, A. **Chronic dacryocystitis following maxillary sinusitis.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 27-32.

Three operations failed to heal a fistula from a lacrimal sac. At the fourth operation a tract was located that communicated with the antrum. Repair of this condition effected a cure.

P. J. Leinfelder.

Hildreth, H. R. **Surgical-diathermy extirpation of the lacrimal sac.** Amer. Jour. Ophth., 1936, v. 19, Aug., pp. 699-700.

Humbert, R., and Rossano, R. **Clinical and electrical study of a case of partial hereditary and familial facial diplegia.** Ann. d'Ocul., 1936, v. 173, May, pp. 369-381.

A man of 31 years had had bilateral weakness of the facial muscles since birth. The face had a masklike expression suggestive of paralysis agitans. There was ptosis with inability to close the lids firmly. Reflexes involving the orbicularis oculi were diminished or absent. Detailed chronaxiometric studies of the facial muscles were made. The same type of facial diplegia was present in the father, a brother, a niece, and a nephew of the patient.

John C. Long.

Krause, J. **Alternating current used dielectrically, so-called short-wave therapy, in ophthalmology.** Zeit. f. Augenh., 1936, v. 89, July, p. 266.

According to Schliephake, this form of alternating current with a frequency of 10 to 100 million differs from diathermy in that the heat develops in the smallest particles of the dielectric body. The method has been but slightly used in ophthalmology. The most promising results have been in cases of lid abscess and tear-sac phlegmon. The author limited himself to lesions of this nature and gave only two to four treatments, because he believed that this form of therapy should show prompt success if of any value. Though his series is small, the results are so striking and unequivocal that he recommends the treatment. It must begin very early. Tear sacs phlegmons that have spontaneously perforated do not respond. It seems unlikely that the treatment endangers the eyeball, in view of Schliephake's irradiation of the brain and the animal experiments which Krause reports in this paper.

F. Herbert Haessler.

Moretti, Egisto. **Contribution to the surgery of relapsing trichiasis of the lower lid.** Author's reprint from Trans. 33rd Congress of Società Oftalmologica Italiana.

A skin incision is made 2 mm. from the lid margin and extending the whole length of the lid. After ample excision of the orbicularis muscle, the follicles of the eyelashes are cauterized and the skin is sutured. In 36 cases excellent results were obtained. W. H. Crisp.

Puscariu, Eléna. **Cicatrization without ectropion, by the use of Carrel dressings, following large sloughs of the lids.** Arch. d'Opht., 1936, v. 53, July, p. 536.

The author has found the Carrel-Dakin treatment of gangrenous lid sloughs very efficient and the resultant scar practically nil. From one to four tubes are introduced (depending on the size of the lesion) and covered with a sterile bandage. It is almost always necessary to make a medial tarsorrhaphy. Two cases are reported in detail. (Illustrations.) Derrick Vail.

Trainor, M. E. **Operation for lid ptosis.** Trans. Sec. on Ophth., Amer. Med. Assoc., 1935, 86th annual session, p. 93.

Trainor's method consists in anchoring the upper tarsus to the superior rectus tendon by dissecting a tongue of the upper margin of the upper tarsus which is passed through a loop of the superior rectus tendon brought into the wound by squint hook traction. Good results are claimed, although the lids are not entirely closed during sleep. (Discussion, 3 figures.)

George H. Stine.

15

TUMORS

Agnello, Francesco. **Basal-cell epithelioma of the limbus.** Rassegna Ital. d'Ottal., 1935, Nov.-Dec., v. 4, p. 801.

There is brief review of the vast literature of epibulbar tumors. Their predilection for the limbus is discussed. Such a case was diagnosed clinically as papilloma but histologically proved epithelial. There were polymorphous cells, deposited in islands and divided by fine strands of connective tissue. The apparent discrepancy between the microscopic and clinical picture affords the author an opportunity to review the numerous classifications of these tumors. He advises marked conservatism in treatment, because of the relative benignity. (5 figures.)

Eugene M. Blake.

Claes, E. M.-J. **Tumor of the semilunar fold.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 181.

These tumors are relatively rare. The author reports one about the size of a grain of wheat, brownish, congenital; the patient 54 years old. She classes the tumor among the conjunctival cystic nevi. (Bibliography, 2 photomicrographs.) Jerome B. Thomas.

Collenza, Domenico. **Palpebral melanosarcoma of tarsal origin.** Boll. d'Ocul., 1936, v. 15, May, pp. 501-513.

A man of 36 years showed a hard tumor-like formation at the inner third of the left upper lid. Through the skin, which was movable over it, the mass appeared to be of blackish color. The adjacent tarsal and bulbar conjunctiva was melanotic. Upon microscopic examination the neoplasm was diagnosed as a sarcomatous melanoblastoma. Five months after removal of the parts affected no relapse was visible. (Bibliography, 4 figures.)

M. Lombardo.

Landan, Jakob. **Astigmatism with epibulbar tumors.** Zeit. f. Augenh., 1936, v. 89, July, p. 288.

In a case of congenital tumor of the corneoscleral border, a dermoid, astigmatism decreased after removal of the mass. In a second case the astigmatism increased with continued growth of recurrence of epithelioma at the limbus. Very little is mentioned in the literature on the development of astigmatism incidental to epibulbar masses.

F. Herbert Haessler.

Mecca, Mario. **Ocular complications of leukemic lymphadenosis.** Ann. di Ottal., 1936, v. 64, May, 326.

The author reports on a case of leukemic lymphadenoma in which the ocular symptoms were retrobulbar and conjunctival with involvement of the lymphatic glands. He considers the views of other authors as to the nature of these enlargements and critically discusses various views as to differential diagnosis. In the case studied, instead of the lesions being in the form of diffuse infiltrations, there were small circumscribed tumors covered by a tenuous conjunctival layer. (One plate, bibliography.) Park Lewis.

Pergola, Alfredo. **Angiomatous polyp of the lacrimal caruncle.** Rassegna Ital. d'Ottal., 1935, v. 4, Nov.-Dec., p. 782.

The polyp, in a child of eleven months, measured 5 by 10 mm. The author describes the clinical and histologic characteristics, and gives the differential diagnosis of other benign growths of this structure. Microscopically the growth was a loose connective tissue, with infiltration by leucocytes and numerous capillaries. (3 figures.)

Eugene M. Blake

Pfeiffer, R. L. **Roentgenographic diagnosis of retinoblastoma.** Trans. Amer. Acad., Ophth., and Otolaryng., 1935, 40th annual meeting, p. 131. (See Amer. Jour. Ophth., 1936, v. 19, Sept., p. 830.)

Puscariu, Eléna. **Epithelioma of the upper tarsal conjunctiva.** Arch. d'Opht., 1936, v. 53, June, p. 427.

A man of 62 years had for two years a swelling of the left upper lid, beginning as a small tumor in the tarsal region and growing, especially rapidly for the past year, until the entire upper and lower lid region was involved. Clinically it resembled the usual epithelioma. Microscopically it was considered a cylindroma. (Illustrations.)
Derrick Vail.

Smaltino, Michele. **Considerations on a case cf glioma of the retina cured by radiotherapy.** Boll. d'Ocul., 1936, v. 15, May, pp. 551-568.

A boy of six years had bilateral partial retinal detachment with glioma. Because of glaucomatous symptoms the right eye was enucleated. The clinical diagnosis was confirmed with the microscope. The left eye, which had normal vision, was submitted to radiotherapy, which controlled the progress of the tumor without injuring the lens or other structures of the eyeball. The cure of the glioma appears to be permanent after several years. (Bibliography.) M. Lombardo.

Weekers, L., and Joiris, P. **Radium treatment of epithelial epibulbar tumors.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 141.

The authors report four cases. Although enucleation may give good temporary results, local recurrence of the neoplasm is apt to occur. Radiotherapy offers evident advantages in an attempt to save the globe. Dosage is important and is far from being determined exactly. Jerome B. Thomas.

16
INJURIES

Baratta, O. **Ocular lesions following an electric flash.** Ann. di Ottal., 1936, v. 64, May, p. 299.

The author describes three cases of cataract following electric shock; two of them bilateral, with a histologic report on the extracted lenses; the third stationary with a tendency to retrogression, associated also with paralytic miosis, a condition of extreme rarity. From pharmacodynamic study of the pupillary reaction the author deduces the pathogenesis in this form of cataract and the incidental ocular lesions. (Bibliography.) Park Lewis.

Connole, J. V. **Lightning and electric cataracts.** Pennsylvania Med. Jour., 1935, v. 38, Sept., p. 939.

Connole reports a case of lightning cataract and concludes that the opacities may be in the anterior or posterior part of the lens, although most frequent in the former position. One or both lenses may become affected. There may be a latent period of two years during which the cataract appears. Voltage varying from 220 to 50,000 may produce a cataract.
Theodore M. Shapira.

Davidson, M. **The minor sequelae of eye contusions.** Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 757-769.

Djacos, G. **A case of electric cataract.** Arch. d'Opht., 1936, v. 53, June, p. 454.

A telephone mechanic accidentally touched a live wire to the right eyelids and sustained a severe shock. He was not unconscious. No external ocular lesion was immediately noticed, but a month later the vision of the right eye became progressively worse. Examination showed typical heterochromia iridis with uveitis and posterior subcapsular lenticular opacity in the right eye. After a few months the eye and also vision improved. The author maintains that the biomicroscopic findings in electric cataract are not always the same. Derrick Vail.

Jaeger, E. **Technical procedure in extraction of magnetic foreign bodies from the anterior chamber.** Klin. M. f. Augenh., 1936, v. 97, July, p. 75.

After an intraocular foreign body has been drawn with the giant magnet into

the lower sinus of the anterior chamber an assistant attracts it with the hand magnet to the center of the cornea and holds it there. A lance keratome is carried through the upper limbus to the center of the pupil and held so that no aqueous escapes. The tip of the hand magnet is applied to the wound. The knife becomes magnetic and the foreign body attaches itself to the outer surface of its blade and is removed with it, the magnet tip remaining in light contact with the knife. C. Zimmermann.

Leinfelder, P. J., and Kerr, H. D. **Roentgen-ray cataract.** Amer. Jour. Ophth., 1936, v. 19, Sept., pp. 739-755.

Leplat, Georges. **Biologic action of the different forms of radiant energy on ocular tissues.** Ann. d'Ocul., 1936, v. 173, June, pp. 433-452.

Radiant energy produces an effect upon ocular structures only when absorbed. The tissues may be influenced either by direct alteration of molecular structure or by alteration of the cells. If the energy acts on vulnerable structures for a sufficient length of time there ensue imbibition, cytoplasmic and nucleoplasmic autolysis, coagulation of proteins with resulting opacification of the lens or cornea, and finally vascular lesions. After an initial vasodilatation there may be obliteration of the vessels with ischemia. The tissues of the eye in their reaction to radiant energy follow the laws of general biology. John C. Long.

Mieses-Reif, Marja. **Two cases of hypersensitivity to henna.** Zeit. f. Augenh., 1936, v. 89, June, p. 224.

In two women who dyed their eyelashes with henna, a tremendous swelling of lids and conjunctiva followed. In one of them the superficial corneal tissue became eroded. Healing occurred in three weeks.

F. Herbert Haessler.

Raverdino, Emilio. **Forceps extraction of traumatic cataract.** Bull. Soc. Franç. d'Opht., 1935, v. 48, p. 215. (See Section 9, Crystalline lens.)

Rossi, Giuseppe. **Effects of compressed air upon the eyes of animals.** Rassegna Ital. d'Ottal., 1935, v. 4, Sept.-Oct., p. 657.

The author exposed rabbits to the action of compressed air, using a chamber especially constructed for this purpose. The following ocular changes were observed: (1) increase of intraocular tension, (2) a tendency to miosis, (3) decrease of the photomotor reflex, (4) conjunctival hyperemia and secretion, (5) diminution of corneal sensibility, and (6) hyperemia and edema of the anterior uveal tract. There was no evidence of injury to the deeper ocular structures. The changes observed are attributed to modification of intraocular circulation and disturbances of the central nervous system by gaseous emboli.

Eugene M. Blake.

Sanctis, G. E. de. **Diathermocoagulation in iris prolapse.** Boll. d'Ocul., 1936, v. 15, April, pp. 447-460.

Through a corneal wound iris prolapse was obtained in seven rabbits. Bipolar diathermocoagulation was applied to the prolapse with varied intensity. The prolapse took a dark gray discoloration and retracted to the level of the corneal surface. Histologic examination of the scar tissue is described. No disengagement of the anterior synechia was obtained. Only mild current must be used, to avoid otherwise grave lesion of ocular tissues. Diathermocoagulation is indicated in old prolapses. In recent ones surgical excision is to be preferred, especially since in this way the synechia is freed. (Bibliography, 3 figures.)

M. Lombardo.

Smith, F. W. G. **Granuloma of the bulbar subconjunctival tissue arising from an imbedded cilium.** Brit. Jour. Ophth., 1936, v. 20, Aug., pp. 455-457.

An unpigmented mass about 4 mm. from the outer limbus of the right eye, in a woman aged 66 years, appeared adherent to both conjunctiva and sclera. The swelling had been apparent for six weeks and was steadily increasing in size. Examination revealed an embedded cilium, which was easily re-

moved with a needle. After the cilium was found, the patient stated that the condition might have arisen following an explosion from an open coke fire. It is the opinion of the author that a piece of coke drove an eyelash through the conjunctiva. (One drawing.)

D. F. Harbridge.

Trattner, S. **Chemical injury to cornea in new-born with report of experiments.** Virginia Med. Monthly, 1935, v. 62, June, p. 163.

In a new-born negro the eyes were treated prophylactically at birth with silver nitrate stronger than the usual one percent solution. The left cornea failed to recover completely, in spite of vigorous treatment with various subconjunctival injections. Trattner concludes that subconjunctival injection as a therapeutic measure may have an adverse effect. Theodore M. Shapira.

Van Duyse and Canneyt. **Does traumatism favor appearance of experimental syphilitic manifestations (primary and metastatic) of the eye, and can it aggravate existing lesions?** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 143-151. (See Amer. Jour. Ophth., 1935, v. 18, Nov., p. 1079.)

Vormann. **Contribution to A. Vogt's late contusion rosette.** Klin. M. f. Augenh., 1936, v. 96, June, p. 819.

The anterior portion of the left lens of a woman of 56 years showed in its depth a serrated opacity with seven dentations which consisted of minute white dots. Undoubtedly it was a Vogt's late contusion rosette, probably caused by a blow on the eye 37 years previously. (Illustrated.) C. Zimmermann.

17

SYSTEMIC DISEASES AND PARASITES

Abdulaev, G. G. **Ophthalmohelminthosis.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 5, p. 716.

Two unusual cases. A student suffered for twelve years from recurrent attacks of inflammatory edema of the right upper lid. A growth in the lid was diagnosed as lipoma, but on excision it proved to be an encapsulated filaria. In the other case a retrobulbar echinococcus cyst the size of a pigeon's egg produced displacement of the eyeball and limitation of motion. Ray K. Daily.

Avizonis, P. **A case of ophthalmomyiasis interna migrans.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 152-156.

In this case of diptera larva in the anterior chamber of a boy of nine years, the signs were severe iritis with much fibrin in the anterior chamber. With healing the larva was seen, but it disappeared before an operation could be done for its removal. (Illustrations.)

P. J. Leinfelder.

Baratta, Orazio. **Visual field, retinal arterial pressure, and intraocular pressure in pregnancy and puerperium.** Boll. d'Ocul., 1936, v. 15, May, pp. 580-597.

In tabulated form the writer gives results regarding thirty women. In 13.37 percent of the cases the visual field was contracted. In 76 percent intraocular pressure was normal while the retinal arterial pressure was increased. The author connects the contraction of the visual field with changes in the retinal arterial system rather than with hypertrophy of the hypophysis. (Bibliography.) M. Lombardo.

Dubois-Poulsen, A. **Functional examination of the kidney and ophthalmology. General review.** Ann. d'Ocul., 1936, v. 172, April, pp. 298-317, and May, pp. 387-399.

This is a very detailed general review of the various methods of studying kidney function, with a discussion of the significance of the findings to the ophthalmologist. Determinations involving urinary contents, chemistry of the blood plasm, power of excreting various substances, water metabolism, and acid-base equilibrium are considered. There is a discussion of the significance of findings in glaucoma, retinal detachment, and renal and diabetic retinitis. (Bibliography.)

John C. Long.

Gilbert, W. **Relations of affections of the fifth nerve to intraocular operations.** Klin. M. f. Augenh., 1936, v. 97, July, p. 70.

A woman of 57 years had suffered for years from obstinate neuralgia of the right side of the head without involvement of the eye. The third day after successful extracapsular extraction in the right eye a severe herpes iridis set in with subsequent formation of a pseudomembrane. About six months later removal of the secondary cataract with de Wecker's scissors was followed by intense hemorrhage into the anterior chamber, which for four months recurred two or three times a week. Vision rose to 5/35 but deteriorated from hypertension, which could not be relieved by trephining. On account of constant neuralgia the almost blind eye was enucleated at the patient's request. The author assumes that the herpes virus invaded the fifth nerve endogenously. Chronic neuritis in the ciliary nerves produced the neuralgia without involving the eye, until the intraocular operation affected the terminal branches of the ciliary nerves. Trigeminal neuralgia must be considered a contraindication to intraocular operation until at least six months after the last attack.

C. Zimmermann.

Inman, W. S. **The emotional factor in the causation of diseases of the eye.** Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 423.

The author emphasizes the emotional etiology of glaucoma, epiphora, concomitant squint in childhood, and recurring inflammations. A number of case reports are given, which apparently corroborate the author's contentions. An endocrine basis is suggested.

Beulah Cushman.

Jayle, G. E., and Mastier, P. **Ocular symptoms and complications of papular fever.** Bull. Soc. Franç. d'Opht., 1935, v. 48, pp. 273-279.

The authors report three cases of this exanthematous fever of coastal regions in which ocular symptoms and complications were noted. A mild conjunctivitis may be a symptom of the disease, and may be accompanied by superficial ulceration of the cornea. The conjunctiva may also be the site of inoculation (an unidentified virus), in which event the appearances are similar to those of acute Parinaud's conjunctivitis. A neuroretinitis occurs as complication of the disease.

P. J. Leinfelder.

King, E. F. **Ocular involvement in a case of periarteritis nodosa.** Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 246.

The author reviews the literature and gives the histological findings in one case. This man suffered from periarteritis nodosa, the diagnosis being established by pathologic examination of nodules from skin and muscles. During the course of his illness he developed in one eye marked papilledema which subsided completely but resulted in considerable atrophy, and in the other recurrent iritis leading to secondary glaucoma which necessitated removal of the eye. Pathologic examination of this eye revealed intense subacute uveitis, and in the retina infection involving particularly the arteries and periarterial zones. (Illustrations.)

Beulah Cushman.

Kunz, Eberhard. **Concerning the knowledge of immunizing processes in ocular tuberculosis. Model experiments regarding the formation of complement-fixing antibodies.** Arch. f. Augenh., 1936, v. 109, June, p. 706.

The author investigated the part that an active tuberculous focus in the eye plays in furthering an active immunizing process. Into the anterior chamber of a number of rabbits a certain quantity of an emulsion of killed tubercle bacilli was injected and the complement-fixing properties of the blood serum and aqueous with the antigen were repeatedly determined. The complement fixation was held to indicate formation of antibodies.

Into the anterior chamber of one group of rabbits a single large dose (2 mg.) of the emulsion was injected. This produced a severe local reaction lead-

ing to phthisis bulbi. In a second group a mild chronic inflammatory process was maintained by constantly repeated small doses (0.02 to 0.05 mg.). The animals remained healthy and no metastases were found at autopsy. Nine days after the injection the blood serum showed positive complement fixation. This became strongest after nine weeks and remained mildly positive up to twenty weeks. The aqueous became positive only after four weeks and so remained as long as aqueous humor was obtainable. The serum of animals of the group treated with mild doses became positive occasionally two or three weeks after an increased inflammation. The aqueous humor, however, remained negative throughout. The author argues that the antigen from the focus in the eye enters the blood stream, and that the cells of the whole body, but mainly the reticulo-endothelial system, construct the antibodies. A high concentration of antibodies must be present in the blood to pass the blood-aqueous barrier. Local immunity develops later. It is of clinical importance that a focus in the eye may not suffice for stimulation of antibodies ample to pass the barrier.

R. Grunfeld.

Mieses-Reif, Marja. **A case of hypersensitivity to hemp.** Zeit. f. Augenh., 1936, v. 89, June, p. 226.

A 41-year-old female who had previously had mild reactions to hemp worked all day in the hemp field. Tremendous swelling of the skin of her whole body followed. Three weeks later desquamation began, and when she was again able to open her eyes she could not see. The corneae were covered with ulcers: iris and pupil were barely visible. Healing occurred with corneal scars, symblepharon, trichiasis, and deformed lids. F. Herbert Haessler.

Rapisarda, Dante. **Behavior of pupillary diameter, amplitude of accommodation, and ocular tension in fatigued subjects.** Boll. d'Ocul., 1936, v. 15, April, pp. 461-481.

In tabular form the writer gives the results of experiments in 35 fatigued young subjects. He noted: (1) enlargement of the pupillary diameter, which according to him is due to a stimulus of sympathetic nature on the iris dilator either directly or by ischemia of the radial blood vessels of the iris; (2) a diminished amplitude of accommodation due to products of muscular metabolism; (3) a lowered intraocular tension due to diminished blood supply. (Bibliography.) M. Lombardo.

Riad, M. **Ocular leprosy.** Bull. Ophth. Soc. of Egypt, 1935, v. 28, p. 16.

Ocular complications in leprosy usually appear as a late manifestation of the disease. Four distinct types of keratitis can be identified (1) leprotic pannus, (2) superficial punctate keratitis, (3) leproma of the cornea, (4) interstitial leprotic keratitis. The uveal tract is affected much less frequently in the nerve type than in the nodular and mixed forms of leprosy. No pathologic fundus changes were seen among 108 cases. The retina and choroid are not primarily affected.

Edna M. Reynolds.

Rohrschneider, W., and Reiners, H. **Evaluation of pulmonary conditions in eye diseases of suspected tuberculous origin.** Klin. M. f. Augenh., 1936, v. 96, June, p. 778.

Out of 72 adult patients chiefly affected with uveitis, 64 presented slight remnants of a former tuberculous process, six a formerly active but at present entirely inactive process in the lungs, two an active pulmonary tuberculosis requiring treatment. As such pulmonary conditions are also with great regularity observed in adults with healthy eyes they do not allow a definite conclusion as to the etiology of the eye disease. C. Zimmermann.

Sala, Guido. **Ocular changes in Paget's osteitis deformans.** Boll. d'Ocul., 1936, v. 15, April, pp. 437-446.

A woman of 61 years about a year earlier had suffered an attack of intense headache and vomiting, with edema of the cheeks. She had since been subject to rheumatic pains. The writer's examination showed marked edema of the

lids, exophthalmos, slight bilateral nystagmus, pallor of the discs, and total blindness. Roentgenographs showed thickening of the cranial base with lowering of the upper wall of each orbit. The reduction of orbital space had provoked the bilateral exophthalmos, thickening of the optic canals had compressed the optic nerves, and pressure on the blood vessels had caused the lid edema. According to some authors Paget's disease is a chronic rheumatic osteitis. (Bibliography, 2 figures.)

M. Lombardo.

Soliman, A. M. **Effect of endemic diseases on the eye.** Bull. Ophth. Soc. Egypt, 1935, v. 28, p. 9.

In a series of 156 cases of ankylostoma and ascaris infection, trachomatous infection was found to excite a much less marked reaction than in relatively healthy patients. The conjunctiva showed less contracture and shrinking and the corneal complications were less pronounced. Extracapsular extraction of cataract in patients suffering from ankylostomiasis was followed by almost no reaction, in marked contrast with the iritis which nearly always follows such extraction in normal persons. The author believes that the so-called anklylostoma cataract is a misnomer, because a large number of ankylostomiasis cases show no lens changes.

Edna M. Reynolds.

Stroobants, Ch. **Subconjunctival filaria.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 213.

(A case report.)

Tita, Carlo. **A case of conjunctival myiasis (Oestrus ovis).** Rassegna Ital. d'Ottal., 1935, v. 4, Sept.-Oct., p. 613.

While a 25-year-old sheperdess was milking a goat a kid standing near by sneezed into the woman's face. She immediately felt symptoms of severe conjunctival irritation, as by a foreign body. A neighbor washed out seven worm-like objects, but continued irritation caused the patient to present herself for treatment. Two further motile, segmented, grayish-yellow larvae were removed. These were identified as larvae of the gadfly, sub-group Oestrus ovis. (One figure.) Eugene M. Blake.

Toulant and Sarrouy. **The ocular manifestations of the bacillary dysenteries.** Arch. d'Opht., 1936, v. 53, July, p. 523.

This short monograph comprises a summary of the literature and description of a few cases. The most frequent form is the scleroconjunctival involvement, coinciding very frequently with arthritis, appearing ten to twelve days after onset of the disease, and frequently after the intestinal symptoms have disappeared. Iritis is rarer, and it often appears between the twentieth and the thirty-fifth day. It is generally mild though plastic in character. Cyclitis is often associated, but never produces hypertension. Ulcers of the cornea, oculomotor palsies, and choroidal hemorrhages have been observed. It is unknown whether the pathogenesis of ocular complications is toxic or bacterial. Secondary invaders are frequent. (Bibliography.) Derrick Vail.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Abeloos. **The first amblyope class in Belgium.** Bull. Soc. Belge d'Opht., 1935, no. 71, p. 248.

The methods adopted for this sight-saving class in Belgium resemble those used in other countries.

Bahn, C. A. **Popular beliefs and superstitions about eyes.** New Orleans Med. and Surg. Jour., 1935, v. 88, Nov., p. 270.

An interesting, amusing article discussing the layman's beliefs with regard to the eyes. Bahn attempts to explain the origin of some of these superstitions. Theodore M. Shapira.

Eydelnanth, J. S. **The formula of Ostrooumoff for evaluation of loss and capacity for work in cases of diminished vision.** Ann. d'Ocul., 1936, v. 173, June, pp. 469-476.

This formula for evaluating visual loss in the U.S.S.R. is based on a modification of Zehender's formula. It is considered that total loss of one eye disables the individual 33 percent. An index table corresponding to visual acuity was prepared by taking the percentage difference between the different visual acuities expressed in tenths. The formula follows: $X = (2a + b) 0.1068$; X being the percentage loss of capacity for work, a the index corresponding to the visual acuity of the better eye, and b the index of the more defective eye. Final evaluation of capacity for work must be made by the tribunal, which considers the occupation of the injured person. John C. Long.

Kraupa, Ernst. **St. Yves and his nephew.** Zeit f. Augenh., 1936, v. 89, June, p. 223.

St. Yves willed his entire estate to Leoffroy, an oculist who married St. Yves's cook. Palmier, who was the only nephew and pupil and assistant of St. Yves, so stated on his door sign, and Leoffroy tried to prevent him from doing so. Palmier brought suit. The court decreed that Palmier had a right to advertise his relation to St. Yves and that Leoffroy could not adopt the name "St. Yves." He did, however, retain the cook and the fortune of one-half million livres. F. Herbert Haessler.

Lehrfeld, Louis. **Eye physicians selling light.** Amer. Jour. Ophth., 1936, v. 19, Aug., pp. 700-702.

Natanson, D. M., and Winogradov, D. P. **The effect of red light on photographers.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 6, p. 852.

The author studied the visual functions of 21 workers who spent the greater part of the eight-hour working day in the development room, which is poorly illuminated with a red light. All of them were found to have chronic conjunctivitis with hyperemia. No impairment of visual function could be demonstrated. Ray K. Daily.

Scalinci, Noè. **The Ars Probatissima Oculorum of Benvenuto Grasso of the School of Salerno, XII Century.** Ann. di Ottal., 1936, v. 64, Feb. pp. 116-139, and March, pp. 188-208.

This was the first published volume on ophthalmology. Scalinci's scholarly critique on the work of the greatest of medieval ophthalmologists should be read in conjunction with the only English translation extant, that by Casey A. Wood. Scalinci gives a dissertation on all of the known writings of Benvenuto Grasso of Jerusalem as summarized early in the present century by Albertotti.

Benvenuto probably wrote in Hebrew. The treatise appeared in Provençal, old French, and old English, and was soon translated into Latin. Scalinci believes the author to have much originality and analyzes his nosology and therapy. In an earlier essay Scalinci had considered Benvenuto's surgery. Benvenuto influenced ophthalmic development through translations of his writings during the 12th, 13th, 14th and 15th centuries.

Park Lewis.

Tyrrell, S. M. **A visit to an ophthalmic clinic in Vienna.** Brit. Jour. Ophth., 1936, v. 20, Aug., pp. 458-460.

The visit described was to the Meller clinic. D. F. Harbridge.

Usher, C. H. **On a few hereditary eye affections** (Bowman Lecture). Trans. Ophth. Soc. United Kingdom, 1935, v. 55, p. 164.

The author takes up the part played by heredity in choroideremia, gyrate choroidal and retinal atrophy, retinal angiomatosis, ptosis, and epicanthus. He presents an unusual pedigree of retinitis pigmentosa. The historical review includes abstracts of cases and pedigree charts. The statement that choroideremia and gyrate atrophy are different stages of the same disease found favor, as gyrate atrophy was seen on the average in patients ten years younger than those suffering from choroideremia, and visual fields were more often contracted in choroideremia. Wernicke's case of gyrate atrophy of the choroid is referred to. In it the left

fundus resembled choroideremia, and the right fundus gyrate atrophy of middle grade. Opposing this view is the occurrence of choroideremia in twenty-one males to one female and of gyrate atrophy in 15 males to 11 females.

Beulah Cushman.

Vittadini, Angelo. **The conception of myopia by a nineteenth century hygienist.** Rassegna Ital. d'Ottal., 1935, v. 4, Sept.-Oct., p. 674.

This historical review of the work of an unknown oculist, published by Antonio Fortunato Stella of Milan in 1825, was translated by Carlo Donegana, a surgeon oculist and obstetrician of Como, and by him dedicated to the editor. The article does not lend itself to abstract. Eugene M. Blake.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Jegorow, I. G. **The blood vessels of the cornea and their innervation.** Sovietskii Viestnik Opht., 1936, v. 8, pt. 6, p. 832.

A detailed description of the blood-vessels and nerves of the guinea-pig cornea. In numerous successfully stained preparations the various branches may be seen to arise from the nerve plexuses surrounding the blood vessels; some of these branches end in the connective tissue, while others pierce Bowman's membrane and end among the epithelial cells. These fine branches arising from the perivascular plexuses belong to the vegetative nervous system. Ray K. Daily.

Roberto, S. **The sclerotic protuberance in the eye of the fetus.** Boll. d'Ocul., 1936, v. 15, June, pp. 699-704.

From examination of thirty fetuses between the fourth and ninth months the writer comes to the conclusion that a real posterior protuberance of the sclera as recognized by Ammon does not exist. There occurs only a greater distension of the posterior temporal segment of the globe as distinct from the nasal distension which leads to eccentric implantation of the optic nerve. (Bibliography, 5 figures.)

M. Lombardo.

Stilo, A. **A study on reticular fibers of the human lid.** Boll. d'Ocul., 1936, v. 15, May, pp. 569-579.

The writer gives a description of the reticular tissue as found in different structures of the upper and lower lids and as modified by age from the first days of extrauterine life to 92 years. (Bibliography, 4 figures.)

M. Lombardo.

Winckler, Georges. **Double innervation of the extrinsic muscles of Sus scrofa domesticus and Sus scrofa.** Ann. d'Ocul., 1936, 173, June, pp. 453-467.

The extrinsic eye muscles of the hog and wild boar were dissected with special reference to their nerve supply. In both animals it was very easy to demonstrate a double nerve supply—motor and proprioceptive. The latter fibers leave the muscle independently of the motor nerves and join the trigeminal nerve. With few exceptions the motor nerve enters the muscle on the side opposite the sensory nerves. There is a general discussion of the mode of innervation of the ocular muscles.

John C. Long.

NEWS ITEMS

Edited by H. Rommel Hildreth
640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month

Deaths

Dr. Clarence King, Cincinnati, died August 15, 1936, aged 57 years.

Dr. Philip Abernathy Graves, Oak Park, Ill., died July 17, 1936, aged 63 years.

Dr. Marion Earle Brown, New Orleans, died August 19, 1936, aged 50 years.

Miscellaneous

The Bureau of Human Heredity, 115 Gower Street, London, W.C. 1. England, issues the following announcement: The object of this Bureau is collection on as wide a scale as possible of material dealing with human Genetics. Later, the tasks of analysis of material and distribution of the information available will be added. The Bureau is directed by a Council representing medical and scientific bodies in Great Britain. It is affiliated with the International Human Heredity Committee, which ensures coöperation in all areas where research is proceeding. The Council would be grateful to receive all available material from institutions and individuals, furnishing well-authenticated data on the transmission of human traits whatever these may be. Pedigrees are particularly desired; twin studies and statistical researches are also relevant. As research workers and others who send in material may in some cases wish to retain the sole right of publication (or copyright) those who so desire are asked to accompany their material with a statement to that effect. Material should be given with all available details in regard to source, diagnostic symptoms, and the name and address of the person or persons who vouch for accuracy. All such details will be regarded as strictly confidential. Reprints of published work would be most acceptable. Furthermore, many authors when publishing material may also have collected a number of pedigrees which they have been unable to reproduce in detail. It is the object of the Council that such records, by being included in the Clearing House, should not be lost. Those wishing for a copy of the Standard International Pedigree Symbols may obtain one from the office. Announcements in regard to the services undertaken by the Bureau will be published from time to time. Chairman: R. Ruggles Gates. Executive Committee: R. A. Fisher, J. B. S. Haldane, E. A. Cockayne, J. A. Fraser Roberts, L. E. Halsey (Hon. Treasurer), C. B. S. Hodson (Hon. Gen. Secretary).

The International College of Surgeons, with headquarters in Geneva, Switzerland, wishes to announce that it will hold its first examination for Membership and Fellowship sometime before January 1, 1937. In the United States the examinations will be held in New York City, Chicago, Durham, N.C., San Francisco, San Antonio, Texas, and Rochester, Minn. The recent announcement states that a Surgeon may receive the title of Member of the International College of Surgeons if he is over 30 years of age and passes the required examination. Such examination consists of a written test, a clinical bedside examination, an oral test and operations on the cadaver. The written examination papers will be prepared in Geneva and the same questions will be submitted to Surgeons in every country in the world. The examination for Fellowship is practically the same, except that a man may receive the Specialty Fellowship in any one of the various special branches of surgery. The applicant for Fellowship must be over forty.

Surgeons in the United States desiring to take the examination for either degree should send for an application form to one of the following Regents: Dr. Dean Lewis (National Regent), Prof. of Surgery, Johns Hopkins University, Baltimore, Maryland; Dr. John Erdmann, Prof. of Surgery, Columbia University, New York; Dr. Deryl Hart, Prof. of Surgery, Duke University, Durham, North Carolina; Dr. Frederick G. Dyas, Prof. of Surgery, University of Illinois, Chicago, Illinois; Dr. E. Eric Larson, Clinical Prof. of Surgery, University of California, Los Angeles, California; Dr. A. O. Singleton, Prof. of Surgery, University of Texas, Galveston, Texas. In Canada the examination will be held in Montreal, Quebec, and Toronto, Ontario. Candidates may receive examination application forms from the Dominion Regent: Dr. E. Archibald, Prof. of Surgery, McGill University, Montreal; Dr. D. E. Robertson, Assistant Prof. of Surgery, University of Toronto; Dr. Charles Vezina, Prof. of Clinical Surgery, Laval University, Montreal. The fee for examination will be $250.00 and the same will be required of applicants in Mexico, Panama, and South American countries. Eighty percent of the fee will be returned to candidates who fail to pass the examination.

The American Medical Editors' and Authors' Association is anxious to bring about a closer relationship between author and publisher. The Director wishes to announce that articles on medical subjects may be submitted to him for editing in preparation for publication. This service will be rendered free of charge. The services of the library of the New York Academy of Medicine are available at all times. The author need not be

a member of the Association. Address all manuscripts to Dr. Harold Hays, Director of the American Medical Editors' and Authors' Association, 133 East 58th Street, New York City.

The Medical Library Association at its Annual Meeting, June 22, 1936, passed a resolution recommending the appropriation of adequate funds for the Army Medical Library and its Index-catalogue. It is important that Congressmen understand the fact that the whole medical profession does benefit by this great Library and its Index-catalogue. In recent years the annual appropriation of the Congress has been wholly inadequate to provide sufficient funds to acquire the current medical books and periodicals issued throughout the world, so that they might be available for use throughout the country and for inclusion in the Index-catalogue.

Societies

The Brooklyn Ophthalmological Society announces new officers for the year 1936-1937: president, Dr. Walter V. Moore; vice-president, Dr. E. Clifford Place; secretary-treasurer, Dr. Mortimer A. Lasky; associate secretary-treasurer, Dr. Allen Hull.

The following program of the Scientific Meeting of the Eye Section of the Philadelphia County Medical Society was held October 8, 1936: Dr. Roscoe J. Kennedy: Presentation of cases with fundus changes related to the program topics. Drs. Glenn C. Gibson and P. Brooks Bland: Clinical significance of retinal changes in toxemias of pregnancy. Dr. Bernard J. Alpers: The neurologic aspects of optic and retrobulbar neuritis.

Personals

Drs. George Newton Hosford, and Avery Morley Hicks announce the opening of their new offices, 450 Sutter Street, San Francisco.

Drs. D. H. Trowbridge and Dwight H. Trowbridge, Jr., announce their association in the practice of ophthalmology in Fresno, California.

Dr. Harry S. Gradle has been appointed consultant ophthalmologist to the Indian Medical Service of the Department of the Interior.